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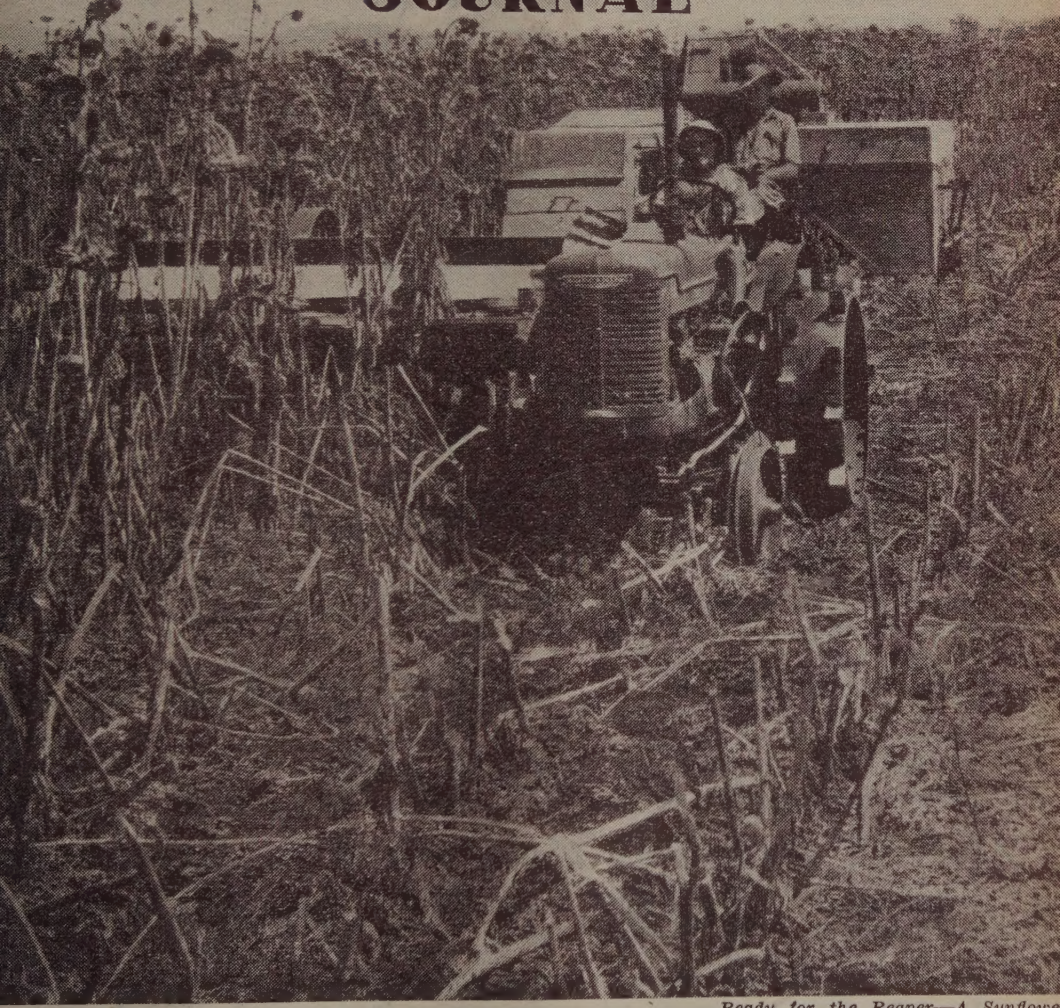

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Queensland Cattle Country.

REVIEWING the status and prospects of the Queensland beef industry recently, the Minister for Agriculture and Stock, Hon. H. H. Collins, said:—

The larger portion of Queensland may be regarded as cattle country suitable for either breeding or fattening. Approximately half the cattle in the Commonwealth are run in this area. The cattle country may be divided for convenient description into Coastal, Gulf and Western regions. The coastal areas are those along the east coast, including the Cape York peninsula and extending 250 miles inland; the Gulf country extends inland from the shores of the Gulf of Carpentaria; and the Western country includes the fringe of the Barkley Tablelands and the Cooper Channel country.

From the cattle lands of Queensland travel most of the stores fattened in the southern States. From the central coastal portion of Queensland are marketed most of the fat cattle slaughtered in Queensland for home consumption and export.

The progress of the beef industry towards full development obviously depends on several factors, including breeding, feeding and the extent to which science is applied to it. It is generally accepted, however, that production in the beef industry can be increased and perhaps doubled.

The breeder has done his job and has done it well. The large herds of the different British breeds in Queensland and in other States of the Commonwealth are proof of the soundness of the service of the breeder to the grazing industry. To the pioneers of that industry who

laid its firm foundations, and to their successors who are carrying on the good work, we acknowledge our debt. By appraising the cattle raising potential of the country by introducing foundation stock from the proved cattle families of Britain, and by assuring a regular infusion of new blood, the cattle breeders of Australia have done great work in the national interest.

The best bred cattle, however, cannot be grown into prime beef unless they are well fed and improved methods of husbandry must be evolved to assure that a regular supply of suitable fodder is available at all times to enable a steady supply of young prime carcases to be marketed from this State.

Such improved methods are only acceptable if economically sound and assure a margin of profit to the producer.

The processing side of the industry has progressed remarkably during recent years. After considerable scientific investigation and experimentation, chilled beef from Queensland was marketed in the United Kingdom in 1934. This was an outstanding achievement and is a milestone in the progress of the Queensland cattle industry. Chilled beef, however, must be produced from prime young high quality cattle and the comparatively small number of the cattle available must be increased in order that a steady flow of beef of this type can be sent to overseas markets.

It would appear that increased production can be brought about by short and long term planning.

In the coastal area, where most of the prime cattle are produced at the present time, production could be stepped up by the provision of additional water, by pasture improvement, and extension of the crop fattening at present being practised in some districts.

On a long range plan, improvement of watering facilities and irrigation, extension of railways into inland areas, such as the Channel region, pasture experiments on summer rainfall country, feeding trials with legumes and grasses which will grow in such country, and crop and grain feeding experiments in districts where fattening of this type is being done at present, will all help to increase production.

The Queensland Department of Agriculture and Stock has for some time been conducting palatability trials with grasses and legumes in rain forest country and is now arranging feeding trials with these pastures.

Similar trials are being arranged under irrigation to be ready for the proposed irrigation schemes.

Recently, a Cattle Husbandry Branch was formed and a special staff is being trained to assist the cattle industries to greater production. The State staff, in collaboration with officers from other States and the Council for Scientific and Industrial Research, is arranging long and short term experiments in a real effort to increase production by economic pasture improvement or crop and grain feeding.

With improved practices in animal husbandry, proper utilisation of our grazing lands, scientific research, particularly in respect of animal nutrition, pasture improvement, crop feeding, fodder cultivation and conservation, who can doubt the future of the cattle industry of Queensland?

Passion Fruit Growing in Southern Queensland.

J. M. WILLS, Adviser, Horticulture Branch.

THERE is no reason why passion fruit growing should not again develop into an industry of considerable importance in southern Queensland. Prior to 1940 extensive plantings had been made on the plateau country of the MacPherson Range, but, owing to the wartime scarcity of labour and material, most of the plantations went out of production and very few new plantings were made. The vine is quite at home on the South Coast and in the higher rainfall areas of the sub-tropical coastal districts generally, where it makes vigorous growth and produces good crops. The fruit is in constant demand on the fresh-fruit market and for inclusion in canned tropical fruit salads, fruit drinks, and confectionery.

Though there are a number of varieties in existence in the State, only one—the purple-fruited *Passiflora edulis*—is grown commercially.

In some parts of southern Queensland, hitherto regarded as essentially banana-growing and dairying districts, there is little virgin land left for banana-growing. Old plantations usually carry a good cover of grass, but at times, because of altitude and inaccessibility to dairy stock, they are unsuitable as grazing areas. On such areas, which otherwise may remain unused, the planting of passion fruit has proved payable.

The passion vine is a vigorous and adaptable plant, but it does not follow that because of this plantings may be made at random and the vines allowed to grow without care. On the contrary, considerable attention is necessary in order to obtain the best results, and disappointment is the usual result of "hit or miss" methods of cultivation.

The prospective grower is advised to commence with a small area, which may be afterwards increased; 4 to 5 acres of vines is generally the maximum area one man can cultivate and attend to, if horse-drawn or mechanically-driven cultivators are used, though more labour will be necessary for harvesting and packing. On less accessible sites, where hand-cultivation is the only practicable method, the area should be substantially less for efficient working; in such circumstances, 2 or 3 acres will be found quite large enough to occupy the full time of the grower.

CLIMATIC CONDITIONS.

The southern Queensland coastal climate is very suitable for passion fruit growing, as the vine thrives under warm, humid conditions. Self-sown plants may commonly be found growing along the edges of rain-forest clearings, roads, and snigging tracks, where they establish themselves with remarkable ease and produce fruit in quantity and of good quality in competition with natural vegetation.

Under normal seasonal conditions, heavy rainfall assures sufficient soil moisture for most of the year for the maintenance of vigorous growth, the exception being perhaps in early spring. Attention to cultivation will usually offset most ill-effects of a dry spring, but where it is prolonged into a dry summer some defoliation and loss of fruit may be expected. Some growers have found passion fruit growing profitable enough to warrant the installation of an irrigation system.

In the south-eastern part of coastal Queensland, frosts occur on flat and low-lying land, but severe frosts are rare on hillside country. When deciding to grow passion fruit, this fact should be kept in view. Light frosts will do little harm to the vines but a severe cold snap will kill the young top growth and may destroy the vines completely.

Plate 121.
A ONE-TIME BANANA PLANTATION TRELLISED FOR PASSION FRUIT VINES.

CROPPING HABIT.

Each crop is borne on new growth. The time which elapses between planting and first fruiting varies considerably and depends chiefly on the time of planting and the strength and vigor of the vines. Vigorous plants commence to bear earlier than less robust ones, and may produce a few fruits at six months. Generally, however, vines planted in the early spring produce the first commercial crop in 12–15 months. When autumn planting is practised, a small crop may be borne the following summer or autumn and the first big crop 18–21 months after planting.

In favoured localities two crops are generally borne yearly—a main summer crop and a secondary winter crop. Approximately ten weeks elapse between the time of setting of the fruit and maturity. Blossoming occurs usually during August, September, and October for the summer crop, and during February and March for the winter crop. Marketing of the summer crop commences in October and may extend to January, with the heaviest pickings in November and December. The winter crop is usually harvested in May and June.

Plate 122.
A SIX-MONTHS OLD VINE SHOWING FIRST FRUIT.

More or less continuous growth occurs in some years when weather conditions are favourable, and this results in the production of flowers and fruit right through the year. Occasionally, definite intermediate crops are obtained. The most evident of these is harvested during the months of February and March, following a November and December

blossoming. These intermediate crops, though light, are usually very profitable, since they are marketed outside the periods of peak harvest. However, they are not normal and are often followed by light settings of fruit for the main crops.

At high altitudes of 1,500 to 2,000 feet above sea level, flowering and cropping habits vary very widely on individual plantations, being influenced by the immediate local conditions. In general there is a main summer crop, which matures later than that on lower lands, with a subsequent winter crop; but on some plantations there is continuous cropping and flowering all the year round. This is influenced to some extent by pruning and consequent forcing of new growth on which the flowers are borne. Other areas, which are exposed to cold winds or lack sufficient sunlight during the winter months, bear exceptionally late crops. On still other sites, the crops are matured very early, even before those on the low lands. Growers planting on such locations are fortunate in being able to harvest their fruit during a period when the market is in short supply, and when prices are consequently considerably higher than those prevailing during the period of peak harvests.

The profitable life of the vine is generally about four years when grown under proper cultural conditions. Maximum cropping is obtained with the second summer crop, following which the tendency is for the vines and the quality and appearance of the fruit to deteriorate.

SELECTION OF SITE FOR PLANTATION.

Six important factors should be considered in selecting a site for a passion fruit plantation—viz., aspect, elevation, shelter, soil, drainage, and accessibility.

Plate 123.
RISING GROUND ON ONE SIDE AND A SOLID BELT OF TIMBER PROVIDE GOOD PROTECTION FROM WINDS.

Aspect, Elevation, and Shelter.

Aspect, elevation, and shelter generally will go together, as a good aspect is often elevated above frost level and sheltered from heavy winds. The aspect for preference should be from east to north, open to the morning sun, and backed by rising ground or dense natural timber to protect it from westerly and southerly winds. An aspect from east to north is naturally warmer, and this fact has a marked influence on the early maturity of the vines and the production of large crops of high-grade fruit, which colour and ripen evenly and rapidly. The exposed tops of ridges should be avoided where the soil has washed; vines rarely do well when planted in such situations.

Soils.

Vines are not very exacting in respect to soils. Any which are reasonably fertile are usually quite suitable, but it is of the greatest importance that they be well drained. Stagnant water at the roots and sour soil conditions are fatal. Soils on which vines are at present growing successfully range from rich rain-forest to light scrub and forest soils. In the case of the firstmentioned, vines have a tendency to produce very heavy, rank foliage; this becomes rather a disadvantage, as extra work is entailed in keeping the growth within reasonable bounds and checking fungus diseases to which the vine is subject. Good scrub and forest lands produce vines of good average growth without the tendency to excessive foliage, while there is little, if any, difference in cropping propensities. Normally, dry, open forest soils do not possess as great an amount of humus as those of rain-forest origin, and after being cleared of the natural timber for two or three years it may be observed that they dry out rather too quickly. This can be rectified, and the ground made

Plate 124.

An Established Passion Fruit Vineyard.—This vineyard is situated at Springbrook on one of the numerous small, richly fertile plateaux of the MacPherson Range, bordering New South Wales in the south-eastern sector of Queensland.

to absorb and hold moisture better, by growing and turning in cover crops during the winter. In addition, the fertility and mechanical condition of the soil also will be improved.

In common with the banana, passion vines thrive on stony ground, and except that cultivation is made more difficult, the presence of surface stone is not undesirable. Moreover, it has the advantages that it minimises soil erosion on hillsides and assists in the retention of soil moisture and the maintenance of a higher soil temperature during winter. It is obvious that the latter is important in maintaining the vigour of the plants and inducing an earlier response to spring conditions.

Plate 125.
PREPARING HILLSIDE LAND BY HAND FOR PASSION FRUIT.

Drainage.

Throughout the coastal districts of southern Queensland there is a heavy yearly rainfall, but during normal wet seasons half the annual fall may be precipitated during two or three months, hence the need for a well-drained soil.

Elevated and sloping sites are usually drained sufficiently, but drains across the slope should be made at intervals to carry surface run-off and control soil washing. These cross or contour drains should be as short as conveniently possible to avoid the necessity for having to carry too much water, and should have but a very gradual fall into main drains provided at intervals. All main drains should be grassed as soon as practicable. Stones may be used if available to reduce the speed of run-off, thus preventing scouring of the drains during periods of heavy, continuous rain. By keeping the surface of the soil well broken up, absorption of rain is increased and the possibility of erosion is lessened.

Accessibility.

The method of cultivation will be decided by the site selected. Mechanical or horse-drawn implements are, of course, more economical, but necessitate the thorough cleaning of the land in the first instance. The presence of logs, stumps, and stones makes hand cultivation necessary, with a corresponding increase in the time and labour required.

When elevated sites are selected, the provision of a "flying-fox" or overhead wiring system will be found a great convenience for the quick and safe transport of fruit to the packing shed, and for this reason a suitable site for a shed should be found or provided. Instructions for the erection of a wiring system may be obtained on application to the Department of Agriculture and Stock, Brisbane. Where possible, the packing shed should be conveniently situated alongside a good road providing access at all times to a railway siding or main road. It should be borne in mind that daily despatch of fruit to market is desirable and that any disorganisation or delay in transport may result in loss.

Plate 126.
A Young Passion Fruit Vineyard on Red-oak Soil at Mudgeeraba.

PREPARATION OF THE LAND FOR PLANTING.

The land in which vines are to be planted should be well prepared in order that the young plants may establish themselves rapidly and develop a good root system which can traverse a greater area from which to draw available plant food. Where ploughing is possible, this should be well and deeply done, and the soil later worked down finely. On land which it is not possible to plough, the soil should be broken up with mattocks or steel-pronged forks. Preparation should be completed by the end of August so that any rain which falls will all be absorbed and the land will be in good condition for planting.

Coastal soils are known to be deficient in lime, and an application of from $\frac{1}{2}$ ton to 1 ton per acre will assist in correcting acidity and generally in improving the condition of the soil.

PLANTING DISTANCES.

Eight to 10 feet is usually allowed between rows, and 15 to 16 feet between plants. The numbers of plants required to the acre at the various distances are 8 feet by 15 feet = 363 plants, 8 feet by 16 feet = 343 plants, 10 feet by 15 feet = 290 plants, and 10 feet by 16 feet = 270 plants. In general, the more fertile the land the greater should be the distance between the vines and the row-spacing should be correspondingly reduced.

Nothing is to be gained by crowding the plants, which should be allowed room for a natural vigorous development. Spacing should be sufficient to permit of cultivation with implements where possible without risking damage to the trellises, even when wide spreaders are used on the horizontal type of trellis. Planting too close in the rows has little or no advantage, for after the first year the foliage of the vines will become too dense. It will then be necessary to cut out, possibly, half the number of vines in order to keep the foliage sufficiently open to admit light and allow for the free circulation of air throughout the vine. Also, it is necessary to permit dead leaves to fall clear to the ground, carrying with them perhaps fungus spores which would more readily infect other portions of the plant if allowed to remain caught up in a mass of foliage on the trellis.

TRELLISING.

For the proper development and ripening of the fruit sunshine and air should penetrate to all aerial parts of the vine, hence the advisability, wherever possible, of running the trellises in a north-south direction. The vines will then have an even distribution of sunlight over the whole of the growth on the trellis. On hillside plantations it is not always possible nor desirable to adhere to this rule, since factors such as the conservation of surface soil are all-important. Less erosion is likely to follow where the vines are planted across the slopes and the soil hilled along the rows with cultivation. Any stones, unburnt logs, &c., should also be placed in the rows. Each row will thus eventually provide a surface drain, which will carry off its share of excess water during periods of heavy rain.

Horizontal and Vertical Trellises.

In commercial vineyards, trellises are mainly of two types, the vertical and the horizontal. Both have advantages and disadvantages, but on the whole the horizontal is considered the more suitable. The outlay for wire, posts, and strainers and their erection is a factor which often influences the type of trellis to be erected. A vertical trellis is less costly, and therefore if posts and strainers have to be purchased many growers erect this kind of trellis at first and for later plantings use the horizontal type. Wherever it is possible for a grower to split and erect his own posts and strainers a considerable saving will result. Usually there is plenty of suitable timber growing handy. Most of the natural hardwoods last longer than the passion vines, and may therefore be safely used, but if selection is possible posts should be split from bloodwood, ironbark, grey gum, or yellow stringy. These timbers will last for many years.

Substantial trellises only should be erected, because they must bear a heavy weight of vine and fruit. The top wire in whatever kind of trellis is built should be not less than 6 feet from the ground in order to permit plenty of room for fruit-bearing laterals and to allow them ample light and air.

In a horizontal trellis (Plate 129) the two wires are run side by side, while in a vertical trellis the wires are run one above the other as in an ordinary fence. The posts for the trellis should be 7 feet 6 inches long, 7 inches wide, and about 4 inches thick. They should be set 18 inches in the ground, and 15 or 16 feet apart, dependent on the distance apart it has been decided to plant the vines.

The strainer posts should be of much heavier timber, and may be either round or split. They should be set 2 feet 6 inches in the ground and must be well strutted or stayed so as to take the strain of the wires; the portion in the ground should be free of sapwood. One strainer to every 80 yards of trellis will prove sufficient in most locations. The posts should be erected with their width across the row.

For a vertical trellis (Plate 127) holes are bored in the posts through which the wire is run. One wire is run as close to the top of the post as practicable, and a second, and sometimes a third wire, is run usually at 12 and 18-inch spacings below, 15 inches being the average spacing between these wires.

Plate 127.
Vertical or Fence Type of Trellis with Three Wires.

As stated previously, the horizontal type of trellis is considered most suitable. The distance between the two wires may be anything from 9 to 24 inches, but wide spacing has the advantage over the closer method in that it permits the entry of sunlight and air between the two sets of laterals, thus promoting the flowering and setting of fruit on the inner growth of the vine. At the same time this practice assists materially in maintaining a more open growth, allowing dead and diseased leaves to fall clear to the ground, carrying with them any fungus spores adhering to their surfaces.

In order to keep the wires apart in a horizontal trellis, a T-piece not less than 2 inches by 2 inches, cut to the length desired, is fastened to the top of the post and the wires run through holes bored in the ends of the T-pieces and strained on the strainer posts.

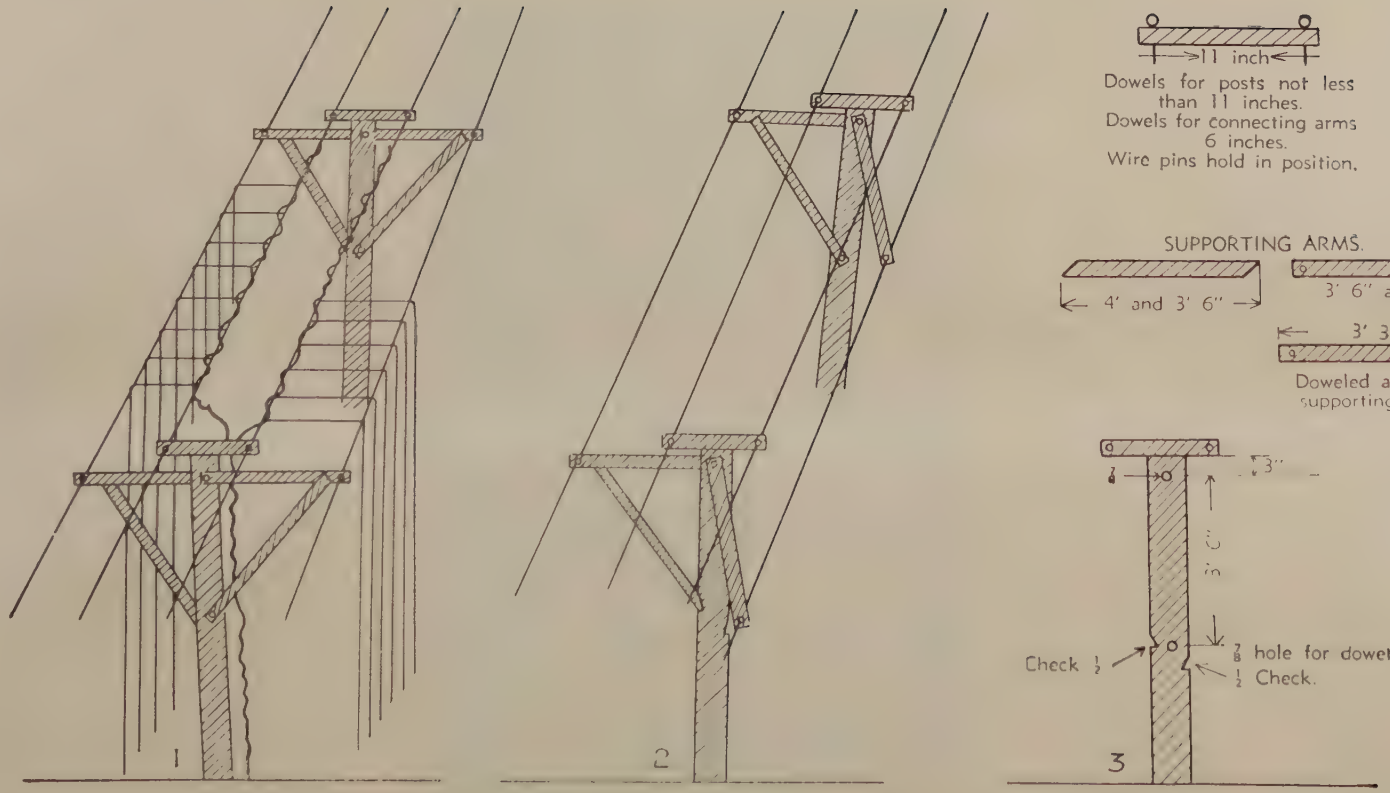

Plate 128.

DIAGRAM SHOWING HOW THE EXTENSION TRELLIS IS ATTACHED TO THE MAIN TRELLIS.

It is an advantage to make some provision whereby the wires can be kept strained, and so prevent heavily-laden laterals from sagging to the ground. Small cast-iron rollers may be procured cheaply and are excellent for this purpose, being easily operated and always in position.

Various gauges of wire are used. Some growers prefer No. 8 galvanised iron wire, while on some of the more recently erected trellises 10 or 12-gauge high-tension steel wire has been used. This wire, though rather thin, is very strong and carries the weight satisfactorily; also, there is less stretching and sagging between the posts than is the case with iron wire. Black iron wire, although cheaper to buy, is not so suitable as it soon rusts, stretches, and sags, necessitating propping up between the posts in order to keep the laterals and fruit clear of the ground.

Should the wires sag between the posts, stakes may be placed temporarily in position to support the wire until the crop has been harvested; then, after pruning, when the weight on the trellis has been reduced, the wires may be restrained with little possibility of the wire snapping.

An Extension Trellis.

The recommended practice is to keep lateral growth of the vines off the ground, and growers are advised to cut back vigorous growths to within 6 inches of the soil surface. When vines lie on the ground the fruit becomes badly scarred and of little value, except as low-grade or factory fruit. Shortening of laterals undoubtedly removes a considerable amount of growth capable of carrying fruit, and the following description of a temporary extension trellis shows how it is possible to increase the length of laterals without hampering cultural, spraying, or harvesting work, and enable a grower to get a higher yield of high-grade fruit from his vines.

Plate 128 illustrates a simple way of attaching an extension set of wires to existing trellises. This extension system makes possible increased lateral growth for an extra 2 feet on each side of the vine, or giving a net gain of 4 feet over the whole lateral growth of the vine. In addition, the extra shade provided by the extension gives greater protection from the direct rays of the sun for the main stem of the vine; this is very noticeable where trellises are 6 feet or more above the ground. Moreover, a greater area of ground is shaded during hot weather, and this helps to keep the surface soil at a moderate temperature, reduces the loss of moisture through evaporation, and makes weed control easier, thus reducing chipping costs and allowing more time for spraying and other jobs. After the fruit has been picked, and, if seasonal conditions are suitable, the bearing laterals should be pruned right back. The extension trellis can then be lowered out of the way beside the trellis posts, thus allowing full use of the space between the rows of vines for the planting of green cover crops. When the new laterals have grown sufficiently to warrant its re-erection, the extension trellis can be raised into position again, the wire automatically picking up the lateral growth as it is strained to the proper tension.

The measurements given in the diagram are suitable for trellises where the rows are planted 8 feet apart. Where the planting distance is wider, the length of components may be increased. The system can be installed on either horizontal twin-wire trellises or on the vertical fence type; in the latter type, however, only the laterals from the

leaders on the top wire should be trained over the extension. If sawn timber is used, approximately 15 feet of 2-inch by 1-inch hardwood battening is needed for an extension at each supporting post in the trellis, viz.:—

2 horizontal arms to support wire, each 3 feet 3 inches;

2 supporting members, each 3 feet 6 inches to 4 feet.

The few inches left over will provide sufficient material to make the dowels, which are cheaper than bolts and nuts. A ½-inch hole should be bored about 3 inches below the top of the post to take the wooden dowel on which the extension arms hinge. Of course, holes of similar size are bored in one end of each extension arm, a smaller hole for the wire to pass through being bored at the other end. The arms are set on opposite sides of the post as illustrated. Dowelling is strongly recommended, because the supports are not likely to be knocked out of the check notches during rough weather or when working among the vines.

The extension arms should be at least 3 feet 3 inches, or up to 3 feet 6 inches if desired, and this should allow sufficient room for the grower to reach the centre of the trellis from either side of the vine, in order to prevent the vine growth from matting and harbouring disease-infected leaves; at the same time, sufficient space is left for passing up and down the rows between the sets of trellis.

The supporting arms should be set at such an angle as to ensure the maximum support. Wooden dowels on which the arms are hinged should be sufficiently long to allow a small hole being bored at each end. Through these a nail or wire pin can be pushed, thus holding the arms in position. The same applies to the dowel holding the arms together near the end through which the wire runs.

No. 10 gauge galvanised wire is suitable for the extension. It should be strained when the arms have been dowelled in position, sufficient length being left at the strainer post so that it can be slackened off slightly when the extension is not in use. Small iron rollers suitable for straining the wire can be purchased cheaply. The wire for the extension is run through the straining post used for the main trellis. No extension arms should be attached to the strainer. The strain on the wire should be just sufficient to support the weight of laterals without sagging between posts. When the extension is not required it may be dropped to hang down alongside the post, the dowels holding the arms together near the wire being removed to facilitate this.

It is not necessary to completely dismantle the extension if the wood used is hardwood, but if softwood is used then it should be dismantled and stored until needed again. If the system is dismantled it will be necessary to mark or number each row and each section of the extension; the posts also from which it is removed should have identification marks so that when required again each member can be re-erected in its original position.

PROPAGATION.

Passion fruit plants may be propagated either from seed or from cuttings, though the latter practice is rare. Growers are recommended to raise their own plants, and for this purpose only fully matured fruits selected from healthy vigorous vines should be used. Great care should be given to the selection of the fruits for seed purposes.

as the passion vine is subject to several diseases and the possibility of transmitting these diseases by seed cannot be ignored. The seed may be allowed to remain in the fruit, which will naturally dry up, until it is required for planting. Another method is to remove the pulp and place it in a vessel of water for a few days until it ferments, when the seeds will easily separate from the fruit pulp. The seeds should then be washed in clean water and placed in the shade to dry.

Should early spring-ripened fruits be selected and the seeds planted immediately, seedlings will be ready to plant out in summer. A later sowing would provide seedlings suitable for autumn transplanting.

If spring planting is desired—this being the season most preferred —then seedlings should be raised from fruits maturing in the previous late summer. Such seedlings should be well grown before winter and be available when seasonal conditions are suitable for transplanting with every prospect of the young vines rapidly establishing themselves in their new situation. The site of the seed-bed should be very carefully selected. It should not be in close proximity to any other passion vines, either cultivated or otherwise, owing to the possibility of introducing woodiness or other diseases into the nursery. The soil should be friable and contain an abundance of plant food. After the soil has been well worked into a fine state of tilth, the seeds should be planted about half-an-inch deep in shallow drills made about 9 inches apart, the soil afterwards being firmly pressed and covered with half-an-inch of fine horse manure as a mulch. The seedlings should appear in from four to six weeks, and as they develop they may be thinned out to about 4 inches apart; those remaining will then develop into sturdy plants with good root development. Lanky, weak plants will result from any crowding in the seed-bed.

Some growers first erect the trellis and then plant several seeds at the required planting distance under the trellis, afterwards selecting the most vigorous of their young plants and removing the others. This practice is not recommended. Germination is often poor, the young plants are exposed to infection from any diseased vines which may be in the vineyard, and, generally, they require extra attention until they become well established.

Transplanting actually may be done at any time during the year, but from September to February is recommended, with a preference for the spring months. March to August planting is generally not advisable, except in very warm situations, as the plants often do not establish themselves satisfactorily and remain stunted.

When plants have reached a height of about 9 inches, they may be safely transplanted. If they have been allowed to grow much more than this, about a fortnight before transplanting the excessive top growth should be cut back and the larger roots severed by pushing a spade down full depth between the rows.

TRANSPLANTING.

Dull, cool or moist weather is better for transplanting than hot, sunny or windy days. Under the latter conditions evaporation of moisture from the young plants is likely to be excessive. It is advisable to dig large-sized holes for the reception of the plants. Approximately 12 inches in diameter and 12 inches deep is best. The position of each

hole should be midway between the trellis posts. When planting, spread the roots evenly in a downward direction at about 45 degrees, and fill in fine top soil, which should then be well firmed. When the hole is completely filled with soil, the plants should be growing at approximately the same depth as they were in the nursery, but not deeper. If planted too deeply the crown of the plant is likely to be attacked by a fungus rot, which will destroy it.

Only as many plants as can be planted within an hour or two should be dug from the bed at one time, and after removal from the nursery they should be kept continuously covered with a wet sack until planted. It is a good plan to give the bed a thorough soaking with water the day before digging the plants. The roots of the seedlings will leave the bed more easily, and will not be excessively damaged. They will also absorb moisture, which will assist them to recover from the shock of transplanting.

TRAINING THE VINE.

From the beginning the grower should have a definite system in mind and train the vine systematically, so that a good solid framework is modelled on the trellis.

Within a few weeks after transplanting the young seedlings will have become established and vigorous growth will develop. Numerous shoots will appear from the crown of the plant and in most cases they rapidly overtake the original growth of the vine. When they have attained a growth of from 12 to 18 inches, one, two, or four (according to the grower's wishes) of the most vigorous growths should be selected to form the main stems of the vine. All other growth should then be carefully cut away. A light stake or pole should be driven into the ground alongside each seedling and fastened firmly at the top to the wires on the trellis. The stake acts as support for the vines until they have become firmly established on the wires. With the growth of the stems it is necessary to keep them tied at intervals of 9 to 12 inches to the stakes in order to prevent them from being broken or damaged through being blown about by wind.

The common practice with growers is to tie the vines after giving them a twist round the stakes. This is not the best method, because it necessitates at a later stage searching for the ties and removing them; if they are permitted to remain, they may cincture the vines as they grow. The best way is to tie a leaf stalk and tendril to the stakes, leaving the main stems clear of the ties. This is equally efficient as tying the stems, and avoids the necessity for later removal of the ties. Some extra time may be spent in the first place, but it will be more than made up later on. Pieces of strong sacking cut into squares about 6 inches by 6 inches will unravel easily, and the strands make quite good ties.

All side branches arising from the stems between the ground and the wires should be carefully suppressed. Leaves only on the stems between the ground and the wires should be allowed to remain; these shade the stem and aid the development of the young plants.

Each grower must decide for himself whether he prefers one, two or four stems, but two stems are considered most satisfactory. The vines cover the trellis with comparative rapidity, and if planted in the spring produce a good crop in 12-15 months. In addition, there is the

advantage that, if one stem is damaged through any cause, the vine is not completely lost, the second stem remaining to carry on until a new leader is produced. It is important that the stems be as nearly as possible the same size, otherwise the more vigorous stem will rob the smaller and outgrow it. Vines trained on a single main stem take longer to establish a complete cover on the trellis, but during early life are much easier to keep in control, as the growth is not nearly as dense as that developed by the multiple stem system. On sloping land, where trellises may for some reason have been erected up and down the slope, two leaders are best, and as vines always grow more vigorously up hill than down, they should be trained on the wires to grow in the direction of the top of the plantation.

Training on the Vertical Trellis.

In the case of the vertical trellis, if only one stem is left it should be allowed to grow until it reaches the bottom wire, when the top inch or so should be pinched out. The stem will then throw out side branches near the top. Three, or perhaps four, of these should be selected, growing as near to one another as possible. Two should be trained in opposite directions along the bottom wire, and the other one or two carried on to the top wire where, if only one is carried on, the tip should be again pinched out and two wide branches allowed to grow for training in opposite directions along the top wire. If two branches are carried on from the bottom wire, they are merely trained in opposite directions along the top wire.

When two main stems are allowed to grow from the ground, the tip of one should be pinched out on reaching the bottom wire and two branches allowed to develop for training along the bottom wire, whilst the second stem is permitted to grow until it reaches the top wire where it is similarly treated.

In the case of four main stems, two are trained in opposite directions along each of the wires.

Training on the Horizontal Trellis.

With the horizontal trellis, if only one stem is left the tip should be pinched out when the wires are reached, and four branches growing as close together as possible should be allowed to develop for training in opposite directions along the two wires.

If two stems are left, the tips are pinched out and two branches allowed to grow from each, whilst with four stems they are merely trained in opposite directions along the wires as they reach them.

The sections of the vines which grow along the wires are termed "leaders." They should not be permitted to ramble along the wires at will supported only by the tendrils, but should be given long, gradual turns round the wires and loosely tied at intervals, care being taken to maintain the turning in the same direction to prevent sagging loops. Sharp turning round the wires should also be avoided, as this may tend to check the sap flow. As the leaders proceed along the wires lateral growth will develop, and this will be accelerated if leader terminals are nipped out on reaching the approaching growth of the neighbouring vine.

The laterals should be encouraged to grow straight down rather than be allowed to grow in any direction. By controlling the laterals in this way the vines are kept more open, and the work of spraying, harvesting and pruning is made very much easier.

Plate 129.
A HORIZONTAL TRELLIS WITH THREE WIRES.

Plate 130.
A HORIZONTAL TRELLIS WITH FOUR WIRES.

Plate 131.
A Six-Wire Vertical Type Trellis.

Plate 132.
A Trellis Made With Welded Sheep Fencing Wire.—The leaders are spread fanwise.

Training on Other Forms of Trellis.

Apart from the vertical and horizontal trellises described, there are a number of modifications which some growers adopt with varying results. In the main they are more expensive to erect, and it is doubtful whether recompense is obtained for the additional outlay.

Plate 129 illustrates a horizontal trellis with three wires. Two leaders are grown along the middle wire and the side laterals are trained over the outside wires.

Plate 130 shows another form of horizontal trellis with four wires in which four leaders are grown along the inside wires and the side laterals trained over those outside. This system permits of wider cross pieces being used on the trellises, but often results in a mat or shelf of vines on the top of the trellis, which holds dead and diseased leaves instead of permitting them to fall to the ground.

Plate 131 shows a six-wire vertical type of trellis on which twelve leaders are allowed to grow. The use of a trellis such as this results in the side laterals from the top leaders tending to exclude light and air, and consequently smothering those on the bottom wires.

Plate 132 illustrates a trellis made with welded sheep fencing. This type is used in Victoria, where the growth of vines is very slow in comparison with their vigorous development in Queensland. The stems or leaders are spread fanwise over the wires. Good crops are borne and the vines are well spread, but considerably more time is occupied with pruning than when the two-wire horizontal or vertical trellis is used.

CULTIVATION.

Caution is needed in regard to the use of cultivation implements, especially when the vines are in vigorous growth. Passion vines are comparatively shallow rooted, and not a few growers have suffered considerable loss when, with the best intentions in the world, they have ploughed or cultivated deeply at a time when a good crop was hanging, and afterwards found that their fruit just withered and fell and the vines assumed a sickly yellow appearance. Such a condition will follow the cutting and breaking of feeding roots at a time when the vines most need their support. Cultivation, then, during the main growing and fruiting periods should be shallow and confined merely to the control of weeds and the breaking-up of the top inch or so of surface soil to prevent caking.

It is more or less essential to break up the soil deeply once a year, and this is best done during the winter about July after the vines have been pruned. Where horse or tractor drawn implements are used, the land up to within 18 to 24 inches of the vines may be ploughed to a depth of about 6 inches, whilst on steep and rough locations, or where the land has not been stumped, cultivation as deeply as possible up to the same depth is best achieved by the use of mattocks or pronged hoes.

Care is also essential when attempting light cultivation or weed control around the immediate base of the vines in order to ensure that the crown and main roots are not injured by implements. Soil-frequenting fungal organisms often quickly enter at such points of injury and set up a condition known as base rot. It is preferable to hand pull all weeds in the vicinity of the stems. Furthermore, during cultivation the crown of the vines should not be covered with soil or with destroyed weed growth, but left exposed to the sun and air. Little trouble will then be encountered with base rot.

Vines should be kept well cultivated along the lines set out from the time they are planted. They will then develop rapidly and produce good crops. Vines insufficiently cared for when young lack vigour, and their development is retarded. Even if they do produce a large quantity of fruit, it is usually small and of poor quality. Older vines will also suffer during hot dry spells if cultivation is neglected, as the soil cannot hold sufficient moisture at such times to support both vines and weeds.

GREEN MANURING.

The growing of green-manure crops planted between the trellises during the months of October and November to provide a cover crop prior to the commencement of the wet season is a matter which should be given attention. Crops such as Poona pea and other cowpeas, tick beans, field peas, mustard, lupins, and others are suitable. If grown through the wet season and into the winter they will not seriously interfere

Plate 133.

Reconditioning Passion Vine Soils.—Green-manure crop of mustard ready for turning under.

with the growth of the vines, will assist in controlling erosion, and when turned under will materially assist in improving the fertility of the soil. On soils of good to medium fertility a dressing of about 200 lb. to the acre of fertilizer containing nitrogen applied at the time of sowing the seed will be of considerable assistance in the production of a good cover.

On poorer soils or in plantations which have been badly washed, or where hot fires have occurred, the condition of the soil can be improved by turning under green cover crops. On badly washed areas where difficulty may be experienced in getting legumes, such as Poona pea and other cowpeas, to grow, mustard will generally provide a good first crop; subsequently peas may be planted successfully. Cover crops on poor soils will be materially assisted by a preliminary dressing of 1 cwt. of sulphate of ammonia and 2 cwt. of superphosphate per acre.

It has been observed that a crop of skinless barley planted between rows of young vines and ploughed under in February has proved beneficial. It should be noted, however, that after the vines have covered the trellises, ploughing in February should be limited to the middle of the rows, as the root system of the vines will have extended well out by that time. Green crops planted subsequent to the first year's growth of the vines should be confined to a narrow strip along the middle of the rows.

IRRIGATION.

Earlier it was mentioned that, if a dry spring extends into a hot, dry summer, some defoliation and loss of fruit must result. The provision of irrigation water where available will prove a complete safeguard against such a setback, and will prove profitable in other ways in that the vines can be kept growing and blossoming practically throughout the year. It will be noted under the heading of pruning that the time for doing this work is governed to some extent by prevailing weather conditions. Aided by irrigation, this handicap disappears. The vines can be well watered prior to pruning, and again after the operation, without danger of suffering any check, and furthermore can be forced into growth at once for the production of an early crop. Furrow irrigation is to be preferred where the land is nearly level, but on sloping land overhead spraying is quite successful.

During dry periods hand watering will prove worthwhile where irrigation is not possible. It is remarkable how even a small quantity of water poured round the base of each vine every second day will enable the plants to retain not only foliage but fruit. The watering is best done late in the afternoon to avoid loss by evaporation.

FERTILIZING.

The passion vine, being a vigorous grower, demands a plentiful supply of available plant food. The soil, therefore, should be at least reasonably fertile. Where planted on good virgin land there should be ample nutritive elements available for the first year or two. Subsequently, and also from the outset on poorer areas, artificial fertilizers will prove of considerable benefit.

A recommendation as to the best formula to use for all plantations cannot be made dogmatically, for better results have been obtained by the application of certain mixtures on some areas whereas other mixtures have been equally successful in other plantations. Each grower, whilst applying a general mixture to his vines, should carry on small scale experiments with others and note any difference. The amount of fertilizer required will depend to some extent on the fertility of the land, poorer areas requiring more than those of better quality, but from 4 cwt. to 8 cwt. per acre will prove a reasonable application.

The various fertilizer dealers stock general orchard mixtures which have given good results in many instances, whilst other growers experimenting with a special 10–6–10 mixture of sulphate of ammonia, superphosphate, and sulphate of potash have produced excellent crops. Applications of farmyard and poultry manure should be used whenever these materials are available (Plate 134). Whatever fertilizers are applied are best divided into two dressings, one during the winter cultivation about July and a second about January, in order to be in time for the autumn flowering for the winter crop.

Plate 134.
Fowl Manure Being Worked into the Soil.—Note distance from base of plants.

PRUNING.

Some growers claim that pruning definitely gives them bigger and better crops, others say they get just as big crops from unpruned vines but admit that the size of the fruit and its quality are not as good as from pruned vines. In any case, whatever influence pruning has on the size of crops, the wise grower will prune for the following reasons:—

To keep the vine in good health;

To remove diseased, dead, and unprofitable growth;

To keep the growth in check on the wires in order to admit light and air and prevent congestion;

To induce the production of healthy, vigorous wood on which high-grade fruit is set;

To replace spent, bare leaders by the development of new ones;

To keep the lateral growth clear of the ground and properly spaced;

To regulate the time of bearing so that the highest market prices are obtained for the fruit;

To assist disease control and increase the life of the vine;

To cheapen the cost of spraying.

When left unpruned, vines soon become a tangled mass of wood and foliage in which fungus diseases may develop and rapidly shorten the life of the vine. It is essential, therefore, to maintain an open habit of growth in order to admit plenty of light and air to all parts. All dead and diseased wood should be cut away and burnt in order to reduce the risk of infection. The best fruit is produced on healthy, vigorous laterals, and the object naturally is to produce the greatest amount of such growth possible. It will be found that, by checking the

growth of laterals when they are about 6 inches from the ground, strong secondary laterals on which fruit will be borne will be produced all along the sides of the laterals, and the bearing area of the vine will be thus increased considerably. In addition, the vine will be kept free of the blemished fruit which would be produced if the laterals were permitted to grow on the ground. The shortening of laterals to keep them clear of the ground may be done at any time without harming the vine.

Passion vines should be given a heavy pruning once each year. There are modifications in some instances which are discussed later on. Usually, July or August is the best time, when most of the winter crop has been harvested, and before spring growth commences. The most suitable time for commencement of pruning will vary in different districts, and possibly even in different parts of the same district, due to

Plate 135.

VINE AFTER PRUNING.—The laterals are cut back to 9 to 12 inches from the leaders on the wires. It is at this stage that deep cultivation is best practised.

environmental factors bearing on growth and crops, as described earlier. A most important feature also to be borne in mind is that *vines should not be severely pruned during a very dry spell.* The soil should be in good condition so far as moisture is concerned. Severe pruning when the ground is dry has caused the death of many vines. Pruning at about the time mentioned is preferable from the aspect of control of a serious fungus disease known as brown spot, information concerning which is obtainable upon application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

There are no hard and fast rules for pruning. Each vine may present a different problem, and consequently only general recommendations as to the procedure will be discussed. It should perhaps be mentioned that pruning is apt to prove a slow and tedious job, and much patience is required to do the work properly. However, the grower

will be well repaid for the time and care expended. Firstly, with the aid of a reaping hook, all laterals should be severed at about 12 inches below the trellis wires. When this has been done, the great bulk of the vine has been removed, and it is possible to obtain a much clearer view of the more intimate pruning required. From the leaders on the wires all dead, diseased, and spindly wood should now be cut away, using a pair of secateurs, and the stumps of the stronger laterals which it is intended to leave should be allowed to remain about 9 to 12 inches long. Each shortened lateral will then have two or three buds from which the new growth will start for the next crop. It is not advisable to cut back more severely than this, as the bearing capacity of the vine may be affected.

Some growers prefer to give two light prunings each year—one during the winter and a second about January-February, after the main summer crop has been harvested and before flowering for the winter crop commences. Others, in addition to heavy winter pruning, like to give a light pruning following the summer crop. Both modifications give good results, the latter in particular. When conditions are too dry for severe pruning during the winter, the system of two light prunings can be safely adopted.

Light pruning (by which is meant in general the cutting away of up to half the length of the laterals) at any time of the year, provided there is sufficient soil moisture, will cause the vine to put forth new growth and blossom, the development of which regulates the period of production of a crop.

Under ordinary circumstances heavy pruning in the winter will produce a big summer crop and a somewhat smaller winter crop. By shortening back the flowering laterals about October and sacrificing portion of the summer crop, a bigger intermediate crop will be secured, provided, of course, that the weather is not dry. Similarly, by pruning back the flowering laterals for the ordinary winter crop about February, a late winter crop can be secured.

In warm localities the vine puts out vigorous growth much earlier than in exposed and colder areas. The grower is advised to carefully note his own local conditions and prune to suit that particular location.

REPLANTING.

The commercially useful life of a passion vine under optimum conditions is about four years; however, in the majority of cases, two or three years is the maximum life that may be expected owing to the incidence of "woodiness" and other diseases. Some provision should be made for continuity of production by rotation or by replanting.

Under normal vineyard conditions the heaviest crops will be produced when the vines are between 15 and 24 months old. Subsequent crops will be governed by such factors as the cultural, fertilizing, and spray programme adopted and the incidence of woodiness. In any case, a gradual decline in production and quality of fruit must be expected in older vines. In order, therefore, to keep up a supply of good quality fruit, new vines should be coming into bearing every year.

The practice of planting young seedlings midway between older vines in the rows is not recommended because of the rapidity with which they become infected with disease.

Where land is to be replanted all vine growth must be removed from the trellises and either allowed to dry out for burning or fed to stock before replanting.

By rotation, areas can be kept isolated from each other either by distance or natural vegetation. Young seedlings planted out do much better under this system. They are not so much exposed to infection from diseased neighbouring plants, are more vigorous in growth, and produce earlier and heavier yields.

Under rotation extra trellises and more extensive cultivation are necessary. This additional expense is offset, however, by the advantages already mentioned. Under this system, too, the land can be periodically spelled from passion vine growing, and the trellises more easily repaired or replaced as required.

Whatever method is decided on, it must be borne in mind that to obtain the maximum profits from passion fruit growing provision must be made for the setting out of new vines at regular periods to replace the older ones, as their production falls in quality and quantity. Experience suggests that a two-year system of replanting or rotation is satisfactory where disease is kept under control. However, should "woodiness" or other diseases be troublesome, annual planting out of young vines is recommended. .

HARVESTING AND PACKING.

Harvesting, packing, and marketing are quite as important as production, and every grower should aim at presenting to buyers well-matured, properly graded, attractively packed fruit. Enhanced prices received for well-got-up fruit will justify the time and labour expended on its preparation for market.

Fruit should be gathered daily—preferably in the early morning or late evening, when the fruit is cool; it is then not so likely to arrive on the market in a wrinkled or shrivelled condition. All dropped fruit should be picked up first, as a couple of hours in the hot sun is sufficient to cause severe scalding and possibly render the fruit unsuitable for packing.

The degree of maturity at which the fruit is picked from the vine is of vital importance, and judgment is required in order to obtain the right colour without the fruit being so far forward that it is likely to wrinkle. Good colour is very desirable, and during the cooler weather the fruit should be picked when it has assumed a deep purple. However, during hot weather fruit should be gathered when just a light purple shade has extended over half to three-quarters of the surface of the fruit.

When harvesting during wet weather, allow the fruit to dry off thoroughly before picking. All fruit should be carefully picked to prevent the skin being damaged. This is best achieved by grasping the fruit in the hand with the thumb and forefinger on the fruit stalk, then with a forward pressure of the thumb and a backward pressure of the forefinger the fruit will be easily detached at a point where the fruit stalk joins the tendril just above the dead flower.

The picked fruit should be placed—not dropped—into the picking boxes or tins, which should be placed on the ground or slung on the body. These, when filled and until despatched, should be kept as cool as possible and sheltered from strong winds.

Bordeaux spray can be removed by immersing the fruit in a weak solution of hydrochloric acid for one and a-half to two minutes, afterwards washing off with fresh water and allowing to drain before packing.

Passion fruit forwarded to the fresh-fruit market should be packed in half-bushel dump cases. Full instructions for packing the different grades are contained in an illustrated booklet, which may be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Fruit intended for factory use need not be packed in cases but may be forwarded to the canneries in sugar bags or similar containers.

YIELD.

Some controversy exists as to the amount of fruit produced by a passion vine. Naturally, factors such as soil, shelter, location, aspect, irrigation, cultivation, and disease control have a marked influence on production. However, the following production figures of vines which have been grown without irrigation may be taken to represent a good average yield. The seedlings were planted in November, 1945, at Springbrook.

Number of vines .. 700.
Distance .. .. 16 feet between vines.
9 feet between rows.

	Cases.	
November, 1946	19	
December, 1946	60	
January, 1947	169	
February, 1947	67	
March, 1947	68	
April, 1947	43	
May, 1947	20	
June, 1947	49	
July, 1947	135	
August, 1947	182	
September, 1947	18	Vines pruned.
October, 1947	12	
November, 1947	Nil	
December, 1947	Nil	

This gives an average yield of a little more than one half-bushel case per vine per 12 months.

PESTS AND DISEASES.

The passion vine is attacked by some insect pests. Spotting of the fruit results from the feeding activities of some minor sucking insects, but little damage is done beyond a slight blemish of the outer skin. As the pulp is not affected, the fruit is not harmed. Fruit flies attack the fruit in its green stage. The eggs usually do not hatch, but the skin surrounding the puncture becomes hard and detracts somewhat from the appearance of the matured fruit. Red mite may infest the axillary buds of the main stem and sometimes the leaves and fruits. Sulphur sprays may be needed to control it.

Fungus disease such as brown spot and a virus disease known as woodiness or bullet, to which the passion vine is very susceptible, are the main causes for the premature failure in many vineyards. Powdery scab is a minor fungus disease which attacks the terminal growths and fruit during the cooler months of the year. Its attack is more serious on vines up to 18 months old, since the proportion of the plant affected is then relatively greater.

Brown spot is the most troublesome disease affecting the vine. It attacks leaves, stem, runners, and fruit, causing considerable damage, and if neglected will result in the death of the vine within two years. Young vines are not so seriously attacked as older ones, as the more open growth admits light and air and permits most of the affected leaves to fall to the ground, carrying the fungal spores with them.

Woodiness is a serious virus disease, and growers are advised to exercise every care in an effort to prevent its spread.

Literature dealing with the control of passion vine pests and diseases may be obtained on application to the Department of Agriculture and Stock, Brisbane.

METHODS OF MAKING WHITEWASH.

1. Take a half bushel of unslaked lime and slake it with boiling water, covering during the process to keep in steam. Strain the liquid through a fine sieve or strainer, and add to it a peck of salt previously dissolved in warm water, 3 lb. of ground rice boiled to a thin paste and stirred in while hot, one-half pound of Spanish whiting and 1 pound of clean glue previously dissolved by soaking in cold water, and then hang over a slow fire in a small pot hung in a larger one filled with water. Add 5 gallons of hot water to the mixture, stir well; let it stand a few days covered from dirt. It should be applied hot, for which purpose it can be kept in a kettle or a portable furnace. Colouring matter may be added as desired. When a less durable whitewash will answer, this method may be modified by leaving out the whiting and glue and omitting the boiling. It need not be applied hot and may be applied with a spray pump.

2. Slake 25 lb. fresh lime in sufficient water to make a paste, sprinkle in 15 lb. of flowers of sulphur, add 30 gallons of water, and boil for an hour. Then add enough water to make 50 gallons and apply with a spray pump, using a Bordeaux nozzle. This is in some favour as a disinfectant.

3. Take 20 lb. of unslaked lime, 3 lb. of common salt, and 1 lb. of alum. Slake the lime with boiling water until of the consistency of thin cream. To increase the antiseptic properties of the wash, add one-half pint of crude carbolic acid to each bucketful.

4. To half a bucketful of unslaked lime add two handfuls of common salt, and soft soap at the rate of 1 lb. to 15 gallons of the wash. Slake slowly, stirring all the time. This quantity makes two bucketfuls of very adhesive wash, which is not affected by rain.

5. Slake lime with water, and add sufficient skimmilk to bring it to the consistency of thin cream. To each gallon add 1 oz. of salt and 2 oz. of brown sugar dissolved in water. The germicidal value of Nos. 4 and 5 may be increased by adding one-fourth pound of chloride of lime to every 30 gallons of wash.

6. Slake quick lime with enough water to make a thick paste. While it is slaking add a pint of melted lard or other grease and a cupful of salt to a bushel of lime. Add enough water to bring the solution to the consistency of thin cream and strain through a piece of burlap. For chicken house or barn where milk is not made it is advisable to add four ounces of some coal tar disinfectant to every gallon of the mixture.

PLANT PROTECTION

Control of the Banana Aphid.

W. A. SMITH, Assistant Entomologist.

THE banana aphid* is present throughout Queensland banana plantations and has been known for many years as the insect vector or carrier of bunchy top disease wherever that disease occurs. Where the disease is absent the aphid has little effect on the vigour of the plant even though populations are often much higher than would be tolerated by less succulent plants. The aphid has no wild host plant of importance in southern Queensland.

Habits in Relation to Control Measures.

Aphids are found mainly on the lower part of the pseudostem, often well underneath the leaf stalks where some lifting of the margin has allowed entry, and even slightly below the soil surface level. On young suckers the younger leaves carry heavy populations. The funnel leaf of the bunch plant and older suckers is usually infested, though sometimes by only a single winged form. Top hands of young bunches may also conceal a few colonies. The winged forms, which are probably mainly responsible for the rapid spread of bunchy top, have been found in many of the colonies in all these situations.

A Recent Insecticide Experiment.

With the range of insecticides available until recently, it has been considered impracticable to effectively control aphid populations throughout the whole plantation, and treatment has been confined to bunchy top affected stools and those in the immediate vicinity. However, with the advent of new insecticides it was thought desirable to ascertain whether more effective control might not be possible. Consequently, a small experiment was recently carried out using three of these types—namely 4 per cent. benzene hexachloride dust; 1 per cent. DDT plus 1 per cent. benzene hexachloride mixed dust; 0·1 per cent. hexaethyl tetraphosphate spray plus a spreader. A 3 per cent. nicotine dust was also included as a standard of comparison. A single liberal dusting (or spraying) of pseudostems, funnel leaves, suckers and bunches was made. Aphid populations were estimated just before and two days after treatment by counting the number of colonies and estimating their size.

It was found that the survival rate of aphids was fairly high. On the pseudostems the kill was 50 per cent. or perhaps more, the actual figure being very difficult to obtain with accuracy. On suckers and funnel leaves where the colonies are more exposed the kill was much greater.

* *Pentalonia nigronervosa* Coq.

The benzene hexachloride and the DDT-benzene hexachloride dusts both appeared slightly superior to the nicotine dust and the hexaethyl tetraphosphate spray in reducing populations on the pseudostem. The residual effect of the first two of these insecticides may be of additional importance in controlling both the aphids and the ants that carry them about. Observation on ant behaviour two days after treatment, however, showed no noticeable differences as a result of the treatments.

The incomplete kill was due to failure of the dusts and spray to penetrate under leaf stalks, and into tightly rolled funnel leaves. In this respect, it is considered that a plantation practice that makes the stems more accessible to dusting would result in a somewhat higher percentage kill. Such a practice would include a "one bunch-one follower" cultural system and frequent trashing of the stems. Dusting of tall varieties would require a deflecting attachment on the dust outlet of the gun to permit dusting of the funnel leaves.

The main factors affecting the rebuilding of aphid populations after an insecticide is applied are the rate of reproduction of the insect, the establishment of new colonies from individuals distributed by ants and the dispersal of winged forms. In summer, when reproduction is very rapid, populations could be kept at a low level only by treatment probably at fortnightly or three-weekly intervals. In the recent experiment, dusts were used at approximately 20 lb. per acre on a "one bunch-one follower" plantation. The time required for thorough treatment was about 2½ hours per acre, though this period could doubtless be reduced if the stems were clean and easily accessible. The economic practicability of using a benzene hexachloride or DDT-benzene hexachloride dust at this rate on a fortnightly schedule when aphid populations are high would have to be considered in relation to the amount of bunchy top loss prevented. In most instances, it would probably be an uneconomic method of attacking the disease.

Present Recommendations for Aphid Control.

The experiments just described were not sufficiently promising to justify altering the present recommendations for banana aphid control. When a plant shows symptoms of bunchy top and the stool must be destroyed a liberal application of kerosene into and around the funnel leaf in sufficient quantity to ensure that it penetrates all the sheathing leaf bases of the pseudostem will quickly make the plant unattractive to aphids and kill those present. It must be realised that in order to be effective the whole of the pseudostem must receive its quota of kerosene. Otherwise some of the sheltering aphids will survive and when the stool is dug out will travel to other plants and probably transmit the virus to them. At least half a pint of kerosene must be used on each plant and in some cases more may be necessary.

An additional method of preventing aphid survival practised by some growers involves the burning of the plant after treatment with kerosene and before digging out the stool. This method can be dangerous and the grower must first be satisfied that no damage will occur to neighbouring stools and that the fire will not be spread by dry weeds or trash through the plantation and perhaps beyond it.

Fertility and Infertility of Sheep.

G. R. MOULE, Officer-in-Charge, Sheep and Wool Branch.

[*Continued from page* 286, *May*, 1948.]

FLOCK MANAGEMENT.

The Queensland Pastoral Environment.

It is well known that the seasonal conditions in any one year influence the lamb marking percentages recorded on a property. It is no less true that the factors which influence the pastoral environment are important in determining the success which might be obtained in sheep breeding year in and year out in any one district.

Distribution throughout the year is probably more important than the total or average rain recorded in a district. This is particularly the case in sheep breeding, because it is important that there should be adequate feed for the ewes during the latter stages of pregnancy and for the lambs at the time of their birth. This means that a regular and well distributed rainfall is highly desirable for successful lambings.

Three of the most important factors influencing the response of the pasture grasses to falls of rain are—

(i.) The amount of rain which falls;

(ii.) The rate at which the moisture evaporates from the soil;

(iii.) The atmospheric temperatures.

A close study has been made of these factors by officers of the Department of Agriculture. The State has been divided into zones depending upon the distribution, on a bi-monthly basis, of rain heavy enough to produce growth of grass. This has been determined by calculating the ratio of the rainfall to the evaporation from the soil. When this ratio exceeds a certain value the rainfall is considered to be "effective." In addition, consideration has been given to the reliability of the effective rainfall. Plate 136 shows the different zones which enjoy 66 per cent. or greater reliability of "effective" rains for periods of different numbers of months.

It is seen from this map that the far western part of the State does not enjoy reliable rains. The main Mitchell grass areas of the north-west and central-west have only two months of effective rain in the summer (which was considered to commence in October and end in March) at a 66 per cent. level of reliability. East of the Mitchell grass downs the summer rains extend over four months.

Plate 136.

SHOWING THE DIFFERENT ZONES WHICH ENJOY 66 PER CENT. OR GREATER RELIABILITY OF EFFECTIVE RAINS FOR PERIODS OF DIFFERENT NUMBERS OF MONTHS.

Key to Plate 136.

Summer—				
Number of wet months	6	4	2	0
Symbol	A	B	C	D
Winter—				
Number of wet months	6	4	2	0
Symbol	a	b	c	d

For example, Area Bc has effective rainfall for four summer months or two winter months with a 66 per cent. reliability.

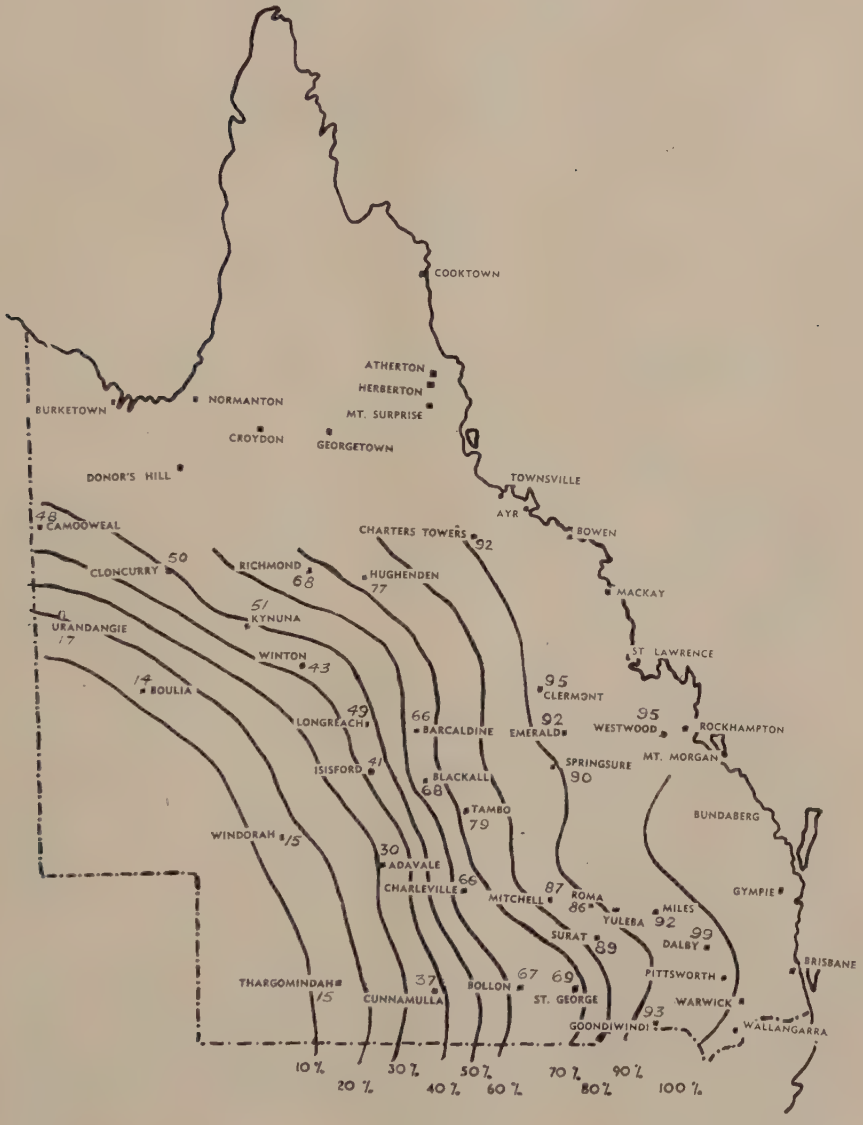

Plate 137.

Showing the Percentage Occurrence of Good to Fair Years in the Pastoral Areas. (For key, see p. 358.)

Plate 138.

SHOWING THE PERCENTAGE OCCURRENCE OF MEDIOCRE YEARS IN THE PASTORAL AREAS. (For key, see p. 358.)

Plate 139.

SHOWING THE PERCENTAGE OCCURRENCE OF BAD YEARS IN THE PASTORAL AREAS. (For key, see p. 358.)

Further south the Cunnamulla district is interesting in that its winter rain is more reliable than its summer rain. The greater part of the Maranoa, however, receives two months of effective rain in both the summer and the winter. The area between Goondiwindi, Dalby, and Surat and extending up to the central highlands at Emerald and Clermont receives four months summer rain or two months winter rain in at least 66 per cent. of the years.

The seasons have been classified as good to fair, mediocre and bad for sheep raising, depending upon the occurrence and distribution of effective rain. The percentage occurrence of these seasons has been calculated and maps have been drawn to show the parts of the State which enjoy the seasons of the various types.

Plates 137, 138, and 139 show the main sheep-raising areas of the south-west and north-west and parts of the central-west in a rather unfavourable light. In the south-west the top feed provided by the heavy growth of mulga makes an important contribution to the safety of the district but in the north-west and that part of the central-west where there is no top feed the majority of the seasons are inclined to be either mediocre or bad. The large proportion of mediocre and bad seasons which occur at Winton makes it difficult to maintain reasonably good lambings in that district.

The occurrence of average maximum monthly temperatures has also been studied, as hot weather has an adverse effect on the quality of the semen produced by rams.

Plate 140 shows the number of months each year in which the average maximum temperatures are over 95 deg. F. This shows a peculiar closed area around Winton, Richmond, and Kynuna in which the average maximum temperatures are 95 deg. F. or over from November to April. This hot area shows a strong tendency to extend towards Camooweal and Urandangie. A comparison between all maps shows that the area which experiences the prolonged summer heat corresponds with a large part of the State which has a high proportion of mediocre seasons. In addition the period of high temperatures corresponds with the occurrence of summer rain.

Key to Plates 137, 138, and 139.

These maps show the percentage occurrence of good to fair years, mediocre and bad years respectively.

The classification was made as follows:—

	Good to Fair.		Mediocre.		Bad.	
	Months of Summer Rain.	Months of Winter Rain.	Months of Summer Rain.	Months of Winter Rain.	Months of Summer Rain.	Months of Winter Rain.
Northern Stations	4	+ 2	2 (late)	+ 0	2 (early)	+ 0
	4	+ 0	0	+ 6	0	+ 2
	2 (late)	+ 2	0	+ 4	0	+ 0
	6	+ 0	2 (early)	+ 2		
Southern Stations	4	+ 2	4	+ 0	2 (early)	+ 0
	2 (late)	+ 2	0	+ 4	0	+ 2
	6	+ 0	2 (late)	+ 0	0	+ 0
	0	+ 6	2 (early)	+ 2		

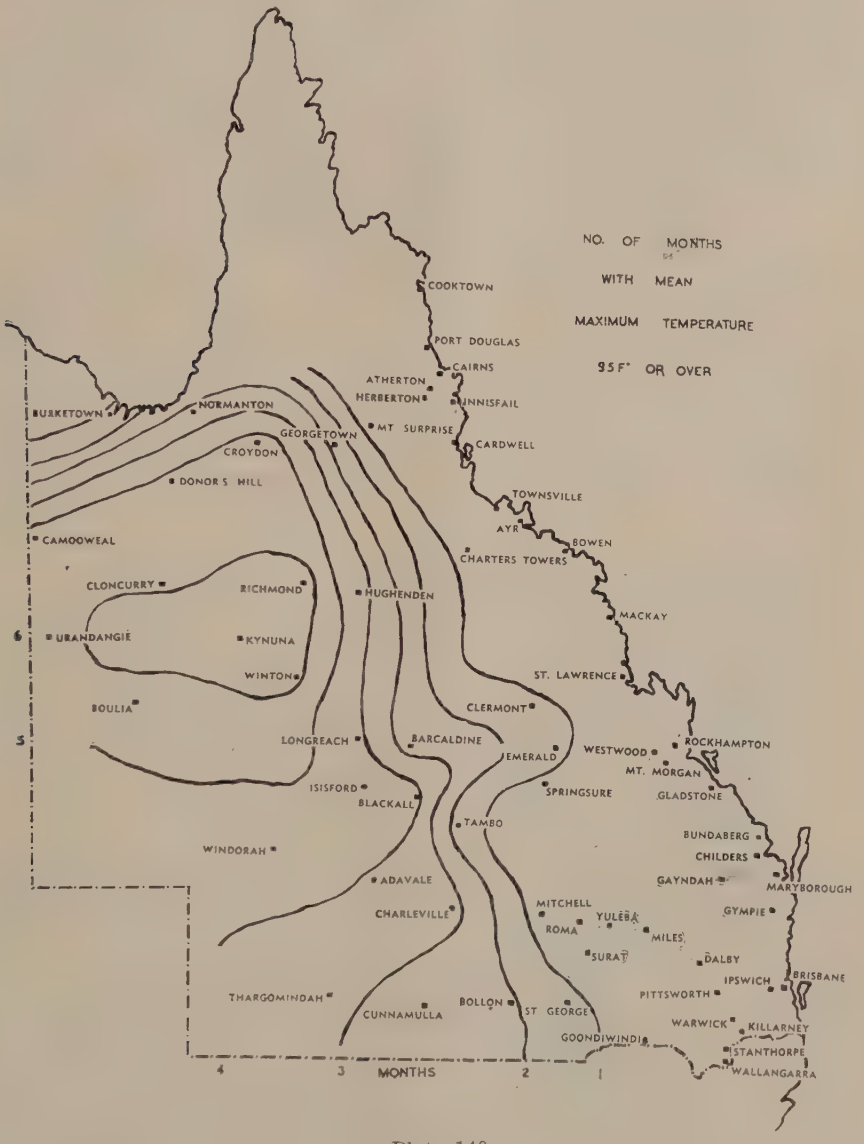

Plate 140.

Plate 141 shows the occurrence and distribution of the main types of vegetation in pastoral Queensland. An appreciation of these maps and the differences they connote is important in planning for lambings in Queensland. For example, allowance has to be made for the capacity of Mitchell grass to last, moré or less as "hay on the stem," and this may counteract to some extent the "mediocre" seasons which occur in the central aras. Owing to the prolonged hot weather in the Richmond-Kynuna-Winton area the feed can go off earlier than in the cooler areas. Consideration has also to be given to the occurrence of top feed from mulga in the Charleville-Cunnamulla-Bollon areas and the mixture of country at Dirranbandi.

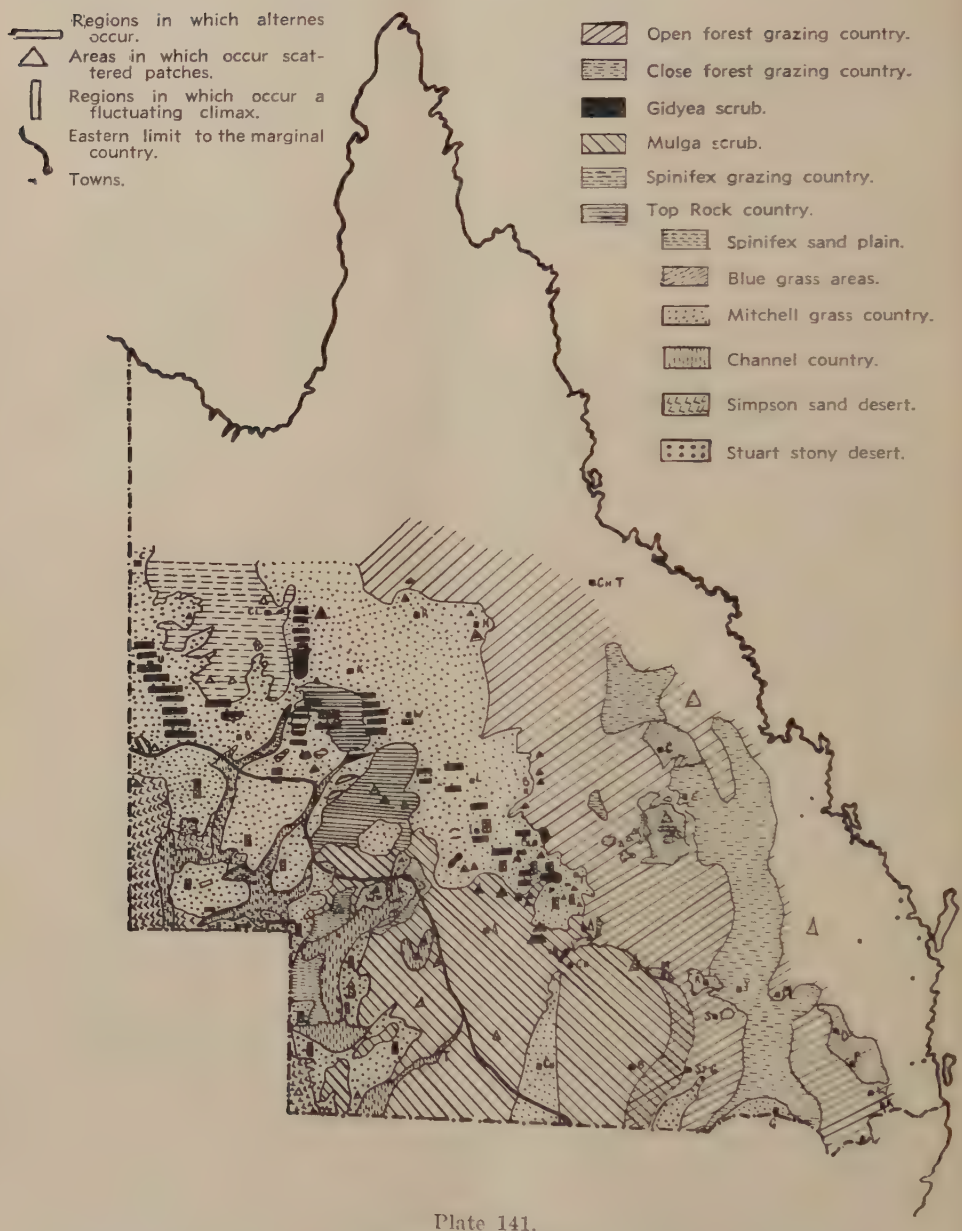

Plate 141.
WESTERN VEGETATION.

The Care of Rams.

It is clear from the section dealing with the fertility of rams that the first essential is to use animals which are enjoying normal sexual health.

This means that care should be used in selecting rams for purchase. An examination should be made of the scrotum and its contents. This can be done with the ram on his feet or he may be "turned up" for a closer inspection.

The scrotum should be palpated, commencing at the "neck," where a careful examination is made of the cords for the presence of varicocele and for any sign of a hernia. The hands are then moved down over the testicles and their size and resilience gauged. They should be manipulated through the hands to note any unevenness, swelling or adhesions to the scrotum itself. Finally the epididymis should be examined carefully just at the tip of each testicle and at the back of the testicles towards their upper end. Any unevenness in size or departure from the normal shape should be regarded with suspicion.

It is as well to remember that changes in the resilience of the testicles, provided they are similar in each gland, are not necessarily indicative of permanent sterility.

Wastage amongst rams is probably higher than most flock-masters recognise. Even if rams enjoying normal sexual health are purchased, some animals are likely to suffer each year from one of the diseases capable of producing permanent sterility. This means that it is advisable to go through the rams each year before joining and reject any which are likely to be suffering from diseases likely to render them wholly or temporarily infertile. *Casting rams on their mouth or age mark alone is not enough.*

Important aspects of the preparation of rams for joining include keeping them cool and giving them the correct feed. As increased body temperatures are likely to render rams comparatively infertile it is essential to muster or move them during the cooler part of the day; that is, during the early morning or late afternoon. The provision of adequate shade for rams greatly assists in maintaining fertility when they are exposed to the high atmospheric temperatures, which occur during the summer months in a large part of north-western Queensland. If shade trees are not available it is well worth the trouble and effort of making thatched shades.

As it may take some weeks for rams to recover from the seminal degeneration brought about by a deficiency of vitamin A, the procedure adopted on so many properties of joining after summer rains does not give the rams sufficient time to reach a reasonably high level of fertility. A prolonged dry spell, so often experienced in central and north-western Queensland, could be counteracted by feeding the rams a supplementary ration rich in vitamin A and protein for six to eight weeks prior to joining. Just throwing the rams a little lucerne or maize each day is not enough. If the rams are to be prepared properly their feeding should be carefully planned. There is considerable evidence to suggest that the formation of calculi (which are stones or gravel in the bladder) may be governed by the food available to the rams. This makes it very essential that advice should be obtained on the feeding of rams prior to joining, or a proprietary ration especially designed for the purpose may be used.

Shearing the rams as frequently as is practicable minimises the risk of fly strike and probably assists in keeping the sheep cool. It is not advisable to mate rams which have been recently struck by blowflies or which have suffered from a suppurating sore. In addition rams should not be dipped in or jetted with arsenical fluids for some weeks prior to joining.

It is always advisable to trim the feet of any rams which require attention prior to joining.

Joining.

The choice of joining time is important and seasonal conditions must be the first consideration. The two points to consider are:—

(i.) What joining time will give the maximum chance of survival of the lambs and their mothers?

(ii.) At what time of the year will the greatest numbers of ewes be coming on heat and when will the rams be at their maximum fertility?

In a large part of Queensland it is difficult to fulfil both these these requirements. This is specially true of the Mitchell grass downs country in the greater part of central and north-western Queensland. Mating ewes to lamb after the summer rains is a hazardous procedure, unless relief country is available, because of the unreliable nature of the rainfall. It also means that the majority of the ewes may not be on heat and the rams may be suffering from temporary infertility on account of the hot weather. On the other hand, an autumn mating may mean that a large number of ewes conceive, but surface water dries up and the plane of nutrition falls as the winter progresses. This means that there is a considerable risk of heavy losses from pregnancy toxaemia and the chances of survival of the lambs are lowered.

Generally little attention is paid to the selection of ewes because of fertility, but the capacity of British breeds (particularly the long wools and their crosses) to bear twins should be considered by fat lamb producers in selecting ewes as lamb mothers.

Infertility of ewes due to disease conditions is not as common as amongst rams. In addition, infertility of a few ewes has not the same importance as that affecting rams. If one ram is infertile it may mean that thirty to forty ewes do not get in lamb.

In selecting ewes for joining it is as well to consider their previous breeding record. Obviously fat lamb breeders will cull out any ewes which have failed to produce a lamb in the previous year as well as those which have blind teats as the result of shearing wounds or mastitis. Usually the detailed history of flock Merino ewes is not well enough known to allow for the rejection of animals with a poor breeding record. In stud work, however, where close records are kept it is possible to cull out young ewes which fail to lamb during their first two seasons.

It is often considered preferable to join the rams when the ewes are on green feed, but the exact time must be decided by the property owner. Full cognizance must be taken of such factors as the seasonal conditions, the occurrence of grass seed, the available top feed, and the property improvements. In the Warrego and Maranoa, where the rainfall is better distributed and where there is more top feed, it is easier to follow a policy with regards to mating at a certain time each year and it is probable that a March, April or May joining in these areas is likely to be attended with considerable success.

In the north-west and the upper central districts the choice between a spring or autumn joining will depend upon whether the property owner has relief country or is prepared to take a risk of summer

rains falling, which will ensure a low mortality rate of ewes and rapid growth of lambs, or if he wishes to play as safely as possible. He must realise he can still lose heavily through a high mortality rate amongst ewes and lambs.

If the rams are in good sexual health, between 2½ per cent. and 3½ per cent. should be sufficient to join with the ewes. In view of the apparent ability of rams to stimulate oestrus amongst ewes which have not been joined for some time, it is advisable to join the rams in two drafts. The first 1½ per cent. or 2 per cent. of rams might be joined and these can be followed about 15 days later by the remaining 1 per cent. or 1½ per cent. Such a procedure would mean that there were fresh rams available to serve the increasingly large number of ewes coming on heat.

Six to eight weeks is sufficient time for joining. The shorter period would give the average ewe a reasonable chance of experiencing a second heat period if she did not mate successfully during the first one. A short joining has an advantage, too, in that it reduces the spread of ages of the lambs and this helps to minimise losses at marking time. It is advisable to cull any ewes which fail to conceive during two consecutive breeding seasons, or which have malformed udders or blind teats.

During joining it is essential to keep a careful check on the rams and to watch for any which become fly-blown or disabled. It is advisable to ride through the flock every few days and pick up a few ewes and move them along quietly to another group which is with a ram. Some men yard the ewes once or twice a week. This may make the wool dusty, which is a disadvantage.

The Care of In-lamb Ewes.

Careful attention given to ewes which are in lamb can pay handsome dividends in the form of increases in the percentage of lambs marked to ewes mated. Protection of ewes from blowflies is extremely important, as is seen from the following table:—

FERTILITY OF EWES—STRUCK AND UNSTRUCK.

Ewes.	Percentage Wet.	Percentage Lambs.
Struck	75	79
Unstruck	92	100

EFFECT OF MULTIPLE STRIKES ON FERTILITY.

Number of Strikes.	Percentage Ewes Wet.
0	92
1	88
2	73
3	58
4	47

In these particular experiments the ewes were protected by the Mules Operation and the increases in the number of ewes which conceived, as well as in the number of lambs reared, were an important benefit derived from blowfly control. The Mules Operation is just as essential as lamb-marking and when ewes have been treated the usual procedure is to join soon after shearing or crutching. Under these circumstances they require very little special attention during the first three months of their gestation.

As the nutritive requirements of ewes which are in-lamb increase fairly rapidly during the last two months of pregnancy, it is desirable, where possible, to keep the ewes on a rising plane of nutrition during this period. In view of the seasonal conditions in the pastoral areas this is often impossible, particularly if the rams have been joined after the summer rains. However, good management includes arranging stocking rates and water facilities so that the ewes have conditions which are as good as are practicable during the last two months prior to lambing. In the central-west and north-west it is often advisable to feed a supplement to ewes which are due to lamb in the late winter or spring. A suitable mixture consists of equal parts of finely ground limestone, coarse salt, and some protein-rich meal such as meatmeal, linseed meal, cottonseed meal, or even ground grain sorghum. The whole can be bound with diluted molasses and fed at the rate of 1 to 2 oz. per head per week.

If the ewes have been joined off-shears they should be crutched about one month prior to lambing. During these operations care should be taken to see that the ewes are not subjected to long periods of starvation by being left in the yards over-long, and it is sometimes inadvisable to drive ewes which are advanced in pregnancy long distances. Such treatment may induce milk fever and or pregnancy toxaemia.

The Survival of Young Lambs.

There is ample evidence of heavy wastage of young lambs. Mortalities can be particularly high between birth and marking and between marking and weaning. Good management aims at preventing these losses. It is well known that the best lambing figures are obtained in the paddocks which have the greatest amount of shade and the most evenly distributed watering facilities. In addition, better results are obtained if the lambing paddocks are small. This minimises unmothering. It is as well to use such paddocks for lambing whenever possible.

Extremely hot weather can easily cause heavy mortalities amongst lambs, particularly if they are called upon to travel long distances when their mothers are in search of food and water. Accordingly, the likelihood of a heat wave occurring when the ewes are lambing has to be considered, particularly by sheep-raisers in the north-west, where the country is so open.

Heavy losses can occur after lamb-marking as the result of unmothering lambs and or from marking wounds becoming infected with virulent bacteria capable of setting up such diseases as gas gangrene, malignant oedema, white oedema, tetanus, or arthritis. These have been described and their control measures discussed in a Departmental pamphlet.

Mothering is an important part of lamb-marking. Various methods are used but the basic principle to adopt is to keep the whole flock moving in the same direction. This minimises confusion and seems to make it a good deal easier for lambs to find their mothers.

CONCLUSIONS.

It is impossible to make a general recommendation which will fit the whole of Queensland. The main points to consider are:—

(i.) Buy rams enjoying normal sexual health;

(ii.) Examine the rams each year prior to joining and remove those which are likely to be infertile because of some disease affecting the genital organs;

(iii.) Prepare rams carefully for joining by—

(*a*) Keeping their wool short;

(*b*) Providing them with shade if the weather is hot;

(*c*) Avoiding the use of arsenic as a dip or for jetting;

(*d*) Feeding them a suitable supplement rich in vitamin A and protein for six to eight weeks prior to joining.

(iv.) In deciding upon joining time take cognizance of—

(*a*) Climatic conditions of the district in which the property is located;

(*b*) The type of pasture and amount of top feed available on the property;

(*c*) The nature and distribution of the water facilities and the occurrence of surface water;

(*d*) The incidence of oestrus in the ewe flock;

(*e*) The occurrence of any other factors which should be considered, such as grass-seed or market requirements.

Acknowledgments.

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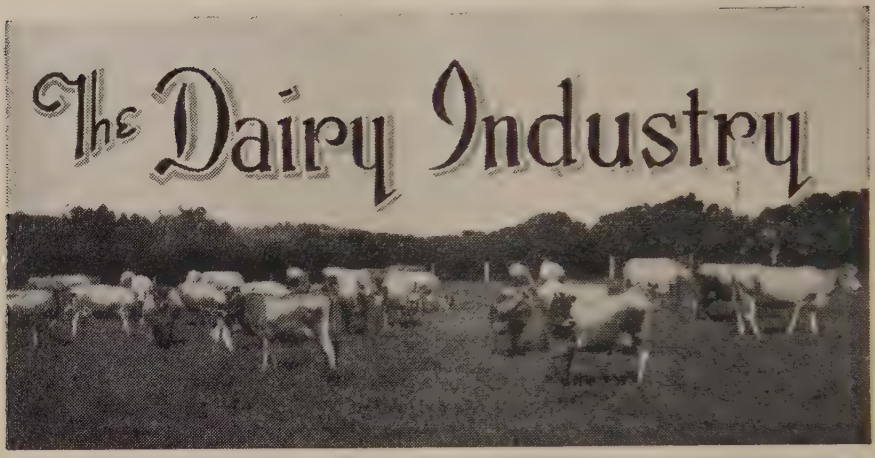
A large part of the studies in Queensland's climatology was suggested by Mr. S. L. Everist, and the computations were made by Joan N. Farmer (Mrs. A. McLellan). Appreciation of their assistance and permission to draw upon hitherto unpublished data is recorded.

RADIO TALKS TO FARMERS
(Australian Broadcasting Commission)
4QR AND REGIONAL STATIONS
THE COUNTRY HOUR—Daily from 12.15 to 1.15 p.m.
4QG AND REGIONAL STATIONS
COUNTRY NEWS MAGAZINE—Every Sunday at 9 a.m.



Farm Water Supplies and Their Treatment.

F. G. FEW, Dairy Technologist, Division of Dairying.

A GOOD and ample supply of water is one of the most tangible assets with which any dairy farm can be endowed. Plenty of water is required for the watering of all farm stock; irrigation of crops, grown as a major farm activity or for some special reason, such as the feeding of stock; essential farm purposes, such as washing and cleansing operations on dairy farms; and, of course, for domestic uses in and around the farm home.

Usual sources are—surface water including river, creek, lagoon or artificial dam; underground water, such as from artesian or sub-artesian bores or wells; and rain water collected from the farm buildings.

No Treatment for Stock or Irrigation Waters.

Irrespective of the source of supply, no treatment is practicable in the ordinary way for water for stock or for growing crops. The particular water is either suitable for the purpose intended, or has deleterious effects if so used. Chemical analysis is the usual method of determining the suitability of a water for stock or irrigation, together with a knowledge of relevant local factors which may widen or restrict its use. Therefore, the Agricultural Chemist requires particular details when a sample of water is sent for analysis. These are considered, together with the analytical results on the sample of water submitted, in deciding on the suitability of the water supply. Generally, stock are more tolerant in respect of the quality of water than crops or other water usages. Most surface waters and many underground sources prove satisfactory for stock, while surface waters are often the only supply of value for irrigation purposes.

Domestic and Cleansing Purposes.

For domestic uses, the housewife is likely to find many surface waters and most underground waters somewhat unsatisfactory, particularly for laundry and general cleansing purposes. Similar remarks apply

to the use of such waters for essential farm cleansing, the twice-daily washing up routine on the dairy farm being a case in point. A general complaint is that the water is too hard for easy and efficient cleansing because of its not lathering well with soaps or other cleansing agents. Water hardness is a result of dissolved mineral salts, mainly of lime and magnesia. Consequently hard waters are wasteful of soap and cleansers and are often unsatisfactory because of the greasy scum arising from the interaction. As a general rule, surface waters increase in hardness as we pass from dam to river, the dam water generally being quite soft although less so than tank rain water. Bore and well waters are usually much harder, although, of course, there are many exceptions to this rule. Another very common objection to the farm water supply for domestic and cleansing purposes is suspended matter, fine clay and organic matter being the chief troubles. This difficulty is more prevalent in surface waters than in those from underground sources, but, of course, exceptions again occur.

Clarification.

Rain water free from both troubles is thus the best for domestic and cleansing purposes on the farm. The only difficulty is sufficient storage during wet weather to last over dry spells. Compatible with a reasonable outlay, however, every effort should be made to utilise all available roof catchments to achieve this end. In the heavier rainfall areas provision can be made for all requirements by having proper water holding facilities. As rain water is so valuable for washing, it should not be needlessly wasted. Because of many circumstances, however, the natural supply is often the only water available for use and the treatments frequently necessary can now be outlined.

The removal of suspended clay or other matter is absolutely essential for efficient washing or general domestic uses. The usual method is to treat the raw water with a small dosage of sulphate of alumina or an allied chemical and allow the water to stand for some hours, overnight for preference. For dairy farms 1,000 gallons of water should be enough for all normal cleansing requirements for one week.

As sulphate of alumina gives an acid reaction in water, it is necessary to neutralise this with soda ash or slaked lime, the former for preference, for laundry purposes. The tank is fitted with a sludge-drain cock at its lowest level and also a drain-off tap some 4 to 6 inches above the base of the tank. The water intake for this drain-off tap should turn upwards to avoid sludge being drawn off with the water. A treatment tank can with advantage be concreted and should be open on top and situated on ground level for convenience. The method of treatment is to fill the tank with raw water and add the necessary chemicals first dissolved in, or mixed to a slurry, with a small quantity of water in a bucket. A wooden paddle worked by hand is quite satisfactory for mixing, provided the tank is not too large, although mechanical stirring can be arranged if so desired. After settling, the clear water is drawn off from the higher tap and the sludge washed out of the tank through the sludge cock. The clear water is then pumped to an elevated storage tank for reticulation by gravity for dairy or domestic uses.

Softening.

Water which is unsatisfactory because of hardness may likewise be treated in tanks to soften it. The same tanks as described for water clarification can be used, the only difference in treatment being the chemicals added. Freshly slaked lime is the main softening agent, used either alone or with soda ash, depending on the dissolved salts causing the water hardness. The technique of treatment is the same as for water clarification, and if both are required, softening is generally done after removing the sludge from the first process. The treatment outlined will not soften the water entirely, and it is the general practice to offset the residual hardness by adding a small amount of a soluble chemical known as sodium hexametaphosphate. This can be done in the high level storage tank, or in the treatment tank if all sludges can be first readily removed. The resulting water will prove suitable for all washing and cleansing purposes, will obviate soap and cleanser wastage and, largely, the deposition of milkstone in cans and milking machines. For many waters, treatment with the soluble phosphate is all that is necessary and this is a very simple procedure.

Testing Waters.

In every case where rain water is not available, a checkup on the water supply in use is strongly recommended. Samples forwarded to the Under Secretary of the Department of Agriculture and Stock can be analysed with a view to deciding an appropriate treatment for each individual case. A representative sample in a clean beer bottle is sufficient for analysis, but for clarification or softening treatment a sample of at least one gallon is required.

Milk Cooling on the Farm.

F. G. FEW, Dairy Technologist.

DURING the four months from January to April of this year tests were carried out to determine the efficiency of milk-cooling on various farms in the Dayboro district. This was made possible through the purchase of two sling psychrometers by the Brisbane Milk Board for use in the field. The results given here are those obtained by Mr. A. Hutchings, Field Officer, Brisbane Milk Board.

The sling psychrometer is simply an instrument by which the existing wet-bulb temperature can be observed quickly and accurately under field conditions. Using evaporative cooling, either in one form of application or another, the existing wet bulb temperature is the lowest to which milk or water can be cooled. This means that without refrigeration no temperatures below wet-bulb can ordinarily be observed on farms, and the cooling efficiency is measured by the deviation from this temperature. A provisional standard has been set whereby satisfaction can be claimed if the milk temperature in the can does not exceed the existing wet-bulb temperature by more than 5° F.

Three different systems for milk cooling were tested, particulars of which are as follows:—

(1) A blower type of cooler in which the descending milk is caught in an upward draught of air provided by a fan. This results in a fine spray of milk within the enclosed cylinder situated above and, after falling, the milk is discharged directly into a can.

(2) A water-cooling tower system using re-circulated water for cooling the milk on a tubular surface cooler. Full particulars of this design were published in this Journal for May, 1946.

(3) Water re-circulated from a suitable storage tank through a tubular surface cooler, no provision being made, however, for the evaporative cooling of the water itself.

The results obtained are given in the accompanying table.

Date.	Location.	Time.	Wet-bulb Temperature.	Milk Temperature in Cans.	Deviation from Theoretically Possible Temperature.	Remarks.
8–1–48	Farm A, Mount Pleasant	5-6 a.m.	61–66° F.	79–82° F.	17° F.	Blower-type cooler used
22–1–48	Farm B, Mount Mee	6 a.m.	66° F.	76° F.	10° F.	Locally made tubular milk cooler in use. Water recirculated from adjacent 1,000 gallon tank, but not subjected to evaporative cooling
22–1–48	Farm C, Mount Mee	6.30 a.m.	66° F.	76–82° F.	13° F.	Blower-type cooler used
22–1–48	Farm D, Mount Mee	7.30 a.m.	66° F.	76° F.	10° F.	Blower-type cooler used
11–3–48	Farm E, Lacey's Creek, Dayboro	4 p.m.	72° F.	75–76° F.	3·5° F.	Water-cooling tower system in use
12–4–48	Farm F, Armstrong Creek	3.30 p.m.	73° F.	73° F.	3° F.	Water-cooling tower system in use
20–4–48	Farm E, Lacey's Creek, Dayboro	7 a.m.	52° F.	58° F.	6° F.	Water-cooling tower system in use. Temperature of water off tower was 52° F.
20–4–48	Farm G, Lacey's Creek	7.30 a.m.	52° F.	66° F.	14° F.	Blower-type cooler used
27–4–48	Farm H, Lacey's Creek	6.45 a.m.	65° F.	67° F.	2° F.	Water-cooling tower system in use
27–4–48	Farm E, Lacey's Creek	7 a.m.	65° F.	67° F.	2° F.	Water-cooling tower system in use
27–4–48	Farm G, Lacey's Creek	7.30 a.m.	65° F.	76° F.	11° F.	Blower-type cooler used

The table shows that in the five tests made on the blower type of cooling system satisfactory results were not achieved in any of the installations; the water-cooling tower system gave satisfaction in four out of the five tests made; while the one water tank system failed to qualify.

It is proposed to make regular tests on all cooling devices in use on farms as opportunity offers. This will be done in as many districts as possible and extending over all months of the year. Results will be published as they become available for the information of farmers interested in this important aspect of quality production on the farm.

PRODUCTION RECORDING.

List of cows and heifers tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S., Jersey, Guernsey, and Ayrshire Societies' Herd Books, production records for which have been compiled during the month of May, 1948. (273 days unless otherwise stated.)

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Mature Cow (Standard 350 lb.).				
Glen Idol Daphne 4th	Estate P. Doherty, Gympie	13,061	595·387	Blacklands Count
Rhodesview Beauty 20th	W. Gierke and Sons, Helidon	11,697·75	556·227	Fairvale Major
Ennismore Bud 2nd	E. W. Jackson, Nobby	11,669·1	473·721	Navillus Prince Henry
Chelmer Maureen	H. F. Marquardt, Wondai	12,496·8	458·951	Hillview Daphne's Elect
Ennismore Remona 2nd	E. W. Jackson, Nobby	11,046·95	428·196	Navillus Prince Henry
Mountain Home Ivy 4th	Queensland Agricultural High School and College, Lawes	9,970·15	426·646	Sunnyview Alert
Jamberoo Grace	A. E. Ezzy, Milmerran	9,451·3	409·781	Brookland Terrace Banker
Ennismore Rose	E. W. Jackson, Nobby	9,817·85	361·114	Navillus Prince Henry
Senior, 4 Years (Standard 330 lb.).				
Navillus Charm 17th	C. O'Sullivan, Greenmount	11,985·3	447·873	Greyleigh Eros
Sunnyview Beauty	K. Berghofer, Athol	9,004·66	371·777	Sunnyview Envoy
Chelmer Star 2nd	H. F. Marquardt, Wondai	9,490·3	362·501	Chelmer Champion's Renown
Junior, 4 Years (Standard 310 lb.).				
Blacklands Lady Gentle 10th	A. Pickels, Wondai	8,944·7	385·356	Blacklands Gar
Yarranvale Fussy	K. Berghofer, Athol	9,154	384·254	Sunnyview Royal National
Senior, 3 Years (Standard 290 lb.).				
Sunnyview Beauty 6th	J. Phillips and Sons, Wondai	16,577·9	733·237	Sunnyview Commodore
Fairvale Doris 7th	W. Henschell, Yarranlea	14,035·75	547·284	Bingleigh Jeans Monarch
Fairvale Minerva 3rd	W. Henschell, Yarranlea	11,152·89	420·667	Bingleigh Jeans Monarch
The Coral's Louie 5th	A. H. Webster, Helidon	9,740·7	393·309	Blacklands Herdsman
Bunya View Dulcie 2nd	K. Berghofer, Athol	8,255·02	338·962	Trevor Hill Reflection
Glen Idol Colleen 2nd	Estate P. Doherty, Gympie	8,784·75	337·146	Blacklands Banker
Mountain Home Gem 61st	M. C. Lester, Glengallon	9,095·4	334·429	Fairvale Ensign
Junior, 3 Years (Standard 270 lb.).				
Sunnyview Thelma 14th	J. Phillips, Wondai	13,731·8	665·037	Sunnyview Commodore
Evermoor Fay	W. A. Freeman, Rosewood	15,414·05	605·725	Frenchview Park Lad
Trevlac Vision	W. A. Freeman, Rosewood	13,598·8	553·32	Trevlac Rosettes Combination
Mountain Home Envy 3rd	A. H. Webster, Stockyard Creek	9,163·8	369·56	Fairvale Ensign
Ardilea Princess 2nd	Hinricksen and Sons, Clifton	8,177·15	337·575	Newstead Reliance
Ardilea Broady 13th	Hinricksen and Sons, Clifton	6,789·15	315·112	Newstead Reliance
Lynfield Ida 4th	D. Birch, Memerambi	7,498·45	274·848	Parkview Ransom

AUSTRALIAN ILLAWARRA SHORTHORN.

SENIOR, 2 YEARS (STANDARD 250 LB.).

Fairvale Myrtle 5th	W. Henschell, Yarranlea	11,035·72	433·884	Bingleigh Jeans Monarch
Lynfield Fidget 3rd	F. E. Birt, Gympie	7,911·35	342·628	Parkview Ransom
Blacklands Lily 15th	A. Pickels, Proston	8,495·2	338·406	Blacklands Carnations Prince
Rhodesview Kitty 28th	W. Gierke and Sons, Helidon	7,898·2	297·682	Alfa Vale Nigel
Rosenthal Perfect 16th	S. J. Mitchell, Warwick	7,125·4	289·323	Rosenthal Lilac 4th Emblem
Glen Idol Daphne 22nd	Estate P. Doherty, Gympie	7,205·2	274·653	Glen Idol Coronet

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Navillus Tiddlewinks 11th	C. O'Sullivan, Greenmount	9,354·8	371·774	Parkview Limerick
Bunyaview Thelma's Pride II.	W. D. Davis, Wambo	7,120·8	321·869	Trevor Hill Progress
Rhodesview Royal Primrose 6th	W. Gierke and Sons, Helidon	7,690·15	311·402	Alfa Vale Nigel
Millievale Stella	A. H. Webster, Stockyard Creek	6,961·2	284·005	Woodville Viscount
Ardilea Princess 4th	Hinricksen and Sons, Clifton	6,770·8	272·391	Newstead Reliance
College Queenie 6th	Queensland Agricultural High School and College, Lawes	5,966·9	260·034	Alfa Vale Pride 3rd
Yarranvale Fussy 2nd	K. Berghofer, Athol	6,685·72	250·788	Sunnyview Royal National
Palmetto Diana 3rd	R. Tweed, Kandanga	6,439·20	242·202	Sunnyview High Caste
Fairvale Jean 15th	K. Berghofer, Athol	6,454·54	238·763	Fairvale Red Prince

AYRSHIRE.

MATURE COW (STANDARD 350 LB.).

Benbecula Winalot	M. J. Brownlie, Nangwee	8,590·65	392·33	Benbecula Brian 2nd

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Myola Thistledown 2nd	J. P. Ruhle, Motley	6,440·1	287·072	Myola Perfection

GUERNSEY.

MATURE COW (STANDARD 350 LB.).

Laureldale Vida	W. A. K. Cooke, Witta	12,473·05	562·729	Minna Murra's Topsy's Sequel 2nd

SENIOR, 2 YEARS (STANDARD 250 LB.).

Laureldale Ethel	W. A. K. Cooke, Witta	8,013·7	418·449	Fernhill Searchlight

JERSEY.

MATURE COW (STANDARD 350 LB.).

Westwood Goldilocks	F. Porter, Cambroon	10,679·1	574·972	Hunstrete Emperor's Volunteer (imp.)
Trinity Princess Royal 2nd	J. Sinnamon and Sons, Moggill	9,291·15	561·775	Trinity Crowning Effort
Boree Promise	W. and C. E. Tudor, Gayndah	8,191·37	452·178	Maurfield Larkspur's Gift
Romsey Ginger Girl	J. Wilton, Killarney	8,843·1	448·126	Oxford Pixie's Victor
Westwood Sapphire	F. Porter, Cambroon	7,498·7	444·61	Westwood Palatine Volunteer
Trecarne Golden Dairy Girl 2nd	T. A. Petherick, Helidon	8,539·95	439·683	Brampton Daffodil's Peer
Trinity Crowning Poppy	J. Sinnamon and Sons, Moggill	9,377·55	424·236	Trinity Crowning Effort
Boree Beauty	W. and C. E. Tudor, Gayndah	9,644·91	397·647	Boree Soldier Boy
Romsey Christmas Eve	J. Wilton, Killarney	7,025·6	394·023	Morago Rivoli Prince
Boree Charming Girl	W. and C. E. Tudor, Gayndah	8,761·75	393·954	Maurfield Larkspur's Gift
Bulby Magnet	T. W. Dennis, Beaudesert	6,651·9	393·917	Bulby Bobby's Boy
Avonview Cute Fern	T. W. Dennis, Beaudesert	7,058·8	357·711	Trinity Cute Ruler
Strathdean Tiny	A. S. Grant, Greenwood	6,722·05	353·316	Strathdean Amber's Ruler

PRODUCTION RECORDING—*continued.*

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
SENIOR, 4 YEARS (STANDARD 330 LB.).				
Trinity Princess Rose	J. Sinnamon and Sons, Moggill	10,761·5	600·635	Trinity Lily's Lad
Ashview Lady 2nd	C. Huey, Sabine	6,657·00	409·289	Trecarne Victor 4th
Romsey Bonny	J. Wilton, Killarney	6,858·9	373·172	Oxford Pixie's Victor
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Trinity Effort's Royal	J. Sinnamon and Sons, Moggill	8,464·35	467·581	Trinity Crowning Effort
Trinity Poppy's Delight	J. Sinnamon and Sons, Moggill	7,415·05	382·011	Samares Cute Prince 3rd
JUNIOR, 3 YEARS (STANDARD 270LB.).				
Glenrae Seaflower	V. Granger, Nerang	6,343·75	425·764	Oxford Dark Victor
Inverlaw Lucy's Queen	R. J. Crawford and Sons, Kingaroy	6,049·7	419·43	Oxford Royal Lad
Austral Park Chance	A. Songreen, Coolabunia	7,282·35	361·572	Austral Park Coronation Oxford
Lawnview Daisy	W. A. Berderow, Fairney View	6,022·1	312·281	Oxford Maxie
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Westwood Melba	F. Porter, Canabroon	7,382·45	438·170	Trecarne Golden King 2nd
Trinity Cute Princess 2nd	J. Sinnamon and Sons, Moggill	8,306·70	431·205	Samares Cute Prince 3rd
Trecarne Jersey Queen 8th	T. A. Petherick, Lockyer	6,185·2	348·891	Trecarne Some Duke
Westwood Valicare	F. Porter, Canabroon	5,274·7	306·049	Trecarne Golden King 2nd
Connemara Mistress Gay	J. Ahern, Conondale	4,936·75	298·157	Glenview Lochiel
Pinegrove Bella	J. W. Evans, Tallegalla	5,591·1	297·516	Roseview Peer
Lawnview Vita	W. A. Berderow, Fairney View	5,293·25	280·515	Oxford Maxie
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Glenrae Melody	V. Granger, Nerang	6,027·6	354·007	Brampton Bandmaster
Boree Cute Petal	W. and C. E. Tudor, Gayndah	7,612·26	353·621	Trinity Cute Commodore
Myrtledale May Queen	H. Sigley, Jaggan	5,727·45	347·053	Palmridges Golden Victory
Boree Efforts Pandora	W. and C. E. Tudor, Gayndah	6,837·96	338·574	Trinity Daffodil's Effort
Romsey Fawn	J. Wilton, Killarney	5,602·3	325·58	Bellgarth Ruler 4th
Westbrook Tulip 133rd (233 days)	H. T. W. Barker, Oakey	5,458·8	301·264	Selsey Royal Standard
Inverlaw Royal Countess	R. J. Crawford and Sons, Killarney	5,816·15	290·845	Oxford Royal Lad
Kathleigh White Fern	H. T. W. Barker, Oakey	4,594·3	252·925	Oxford Daffodil's Victor
Gem Maple	J. W. Evans, Tallegalla	4,628·95	240·777	Gem Valour

Plate 142.

The Great Dividing Range from Kingpah, West Moreton, South Queensland.

MARKETING

Production Trends—May.

In the dairying districts production is declining as herds are reaching the end of the lactation period, but it is considered satisfactory for this time of the year. The quality of milk and cream supplies is fairly satisfactory.

On the Darling Downs barley and oat crops are making good growth, and sowing of the wheat crop is under way. About 5,000 acres of linseed are expected to be planted on the Darling Downs this season.

On the Atherton Tableland harvesting of November planted maize is in full swing. The quality is generally good and the crop is expected to produce from 16,000 to 18,000 tons.

The latest estimate for the 1948 sugar crop is 5,600,000 tons of cane, and, should harvesting proceed without interruption, this figure is likely to be increased.

In the cotton growing areas it is expected that this season will produce less cotton than the previous season. A preliminary estimate by the Cotton Marketing Board for the 1948 crop is in the vicinity of 1,600 to 1,800 bales.

During May dry cool conditions were experienced throughout the pastoral areas, adding further to the serious plight of the industry in the Central Division, where stock are being moved on agistment from a number of properties in that area.

Crop Reporting and Forecasting Service.

The Crop Reporting and Forecasting Service initiated last year by the Division of Marketing of the Department of Agriculture and Stock has been considerably expanded over recent months. A commencement was made with the 1947 autumn potato crop and this was followed by the wheat crop and the 1947 spring potato crop. Maize and grain sorghum were added this year, and attention is being given now to the current wheat and barley crops.

The reports are based on information supplied by practical farmers in key centres of the growing areas who have undertaken to keep the Department informed on conditions in their own localities. Between 200 and 300 farmers are co-operating in this manner. The information is supplemented by reports from Field Officers and collated and analysed at the Head Office of the Department in Brisbane. The completed report is then distributed to radio stations, the press, interested farmers, produce merchants, banks, farm machinery firms, etc.

Comparisons of forecasts with official final figures show that the reports are substantially accurate, considering the largely experimental nature of the work. As an illustration of this a preliminary estimate of 10,000,000 bushels was made for the 1947-48 wheat crop and this was followed by a final forecast that the crop might reach 11,000,000 bushels. The actual production proved to be 10,500,000 bushels.

Denmark Fights Machinery Shortage.

The efforts being made by Denmark to overcome the effects of machinery shortage are described in "Farmer and Stock Breeder" of 10th February, 1948. In October, 1947, an Agricultural Committee was formed to organise a nation wide net of tractor hire stations. This is now working satisfactorily. The Committee sends out teams of experts on periodical tours of inspection to find out what improvements are needed, to check performance on new types of machinery, and to receive first-hand information and suggestions from farmers. It is also aiming at importation of more fuel oil, more machinery (at reduced prices because of bulk purchase) and reduction of taxes by making money spent on hire of machinery deductible from income tax returns.

Ginger Board.

It was announced at the Department of Agriculture and Stock recently that the present growers' representatives on The Ginger Marketing Board, Messrs. G. O. Burnett, V. J. Crosby and R. P. L. Miller, all of Buderim, have been elected unopposed for a further term of three years commencing 16th July, 1948.

GENERAL NOTES

Ex-Servicemen and the Sugar Industry.

Referring to the settlement of ex-servicemen in the Sugar Industry the Minister for Agriculture and Stock (Hon. H. H. Collins) has announced that the Central Sugar Cane Prices Board had approved of apportionment of assignments to be granted under Part III. of *The War Service (Sugar Industry) Land Settlement Act of* 1946 in respect of the following:—

Assignments for land for landless men 156; for land-owners or option-holders 117; for increased assignments 122; for increased peaks 20.

Grade Herd Recording.

Approximately 4,000 cows were tested in six herd recording units conducted by the Department of Agriculture and Stock during the month of May. The best district average came from the newly established unit in the Oakey area. In this case 632 cows from 22 herds produced a daily average of 14.97 lb. of milk containing 4.47 per cent. of butter fat, which is equivalent to .669 lb. of butter fat. This is a good average when it is considered that 12 of the herds averaged below this figure.

The longer established units at Beaudesert and Maleny showed a decrease in the average daily yield owing to the approach of winter conditions.

At Beaudesert, 851 cows from 17 herds produced a daily average of 10.11 lb. of milk per cow. This milk contained an average of 4.83 per cent. of butter fat, equivalent to .488 lb. of butter fat per day. Seven of the herds tested below the unit average.

At Maleny, where two units are being conducted, 1420 cows were tested from 37 herds. The daily average milk yield for each cow was 11.46 lb. containing 5.27 per cent. of butter fat, equivalent to .604 lb. of butter fat per day. Only 12 out of the 37 herds were below the unit average.

Mechanical Sugar Cane Loaders.

Early in the current harvesting season, two new mechanical sugar cane loading units, built by Fowler Construction Co. of Melbourne, were sent to North Queensland for field trials. In an endeavour to overcome labour shortage during recent years a number of mechanical loaders of varying construction have been built within the industry but the new type is quite revolutionary in design. It is drawn behind a conventional tractor and all of its movements are controlled by the tractor-driver by means of an ingenious and simple system of hydraulically operated controls. The loader is capable of lifting 5 cwt. of cane at a time and is expected to handle 10 tons of cane per hour. The units, which are being closely observed by officers of the Bureau of Sugar Experiment Stations, are still being operated experimentally and much more information is required before evaluating their contribution to the problem of canecutter shortage. Great hopes are held out for their ultimate success, however, because reliable mechanical loaders would be one of the major present day advances in the mechanisation of the sugar industry.

New Green Manure Crops.

Considerable interest is being evinced by sugar growers throughout the State in some new green manure crops recently released by the Bureau of Sugar Experiment Stations. A cowpea known as Reeves Selection, Q.1582, has demonstrated marked resistance to bean fly attack and to "wilt" which were making the growing of the standard green manure types more precarious each year. In the wetter areas in particular the fungus causing "wilt" results usually in complete collapse of the common green manure varieties whereas Reeves Selection has grown to perfection under the worst of conditions.

In southern Queensland sugar cane areas some new types of velvet beans have attracted more than usual attention. The drought resistant qualities of these types make them admirably suited for the long rainless periods frequently experienced. Stocks of both these varieties are being propagated rapidly in seed growing areas to supply the ever increasing demand from canegrowers for more suitable legumes.

Rural Topics

Pasture for Silage.

Pasture growth which is being harvested for silage should be cut when the principal plant species is in flower. In the case of paspalum, early cutting while the ergots are in the "honey dew" stage avoids the danger of digestive troubles when feeding later. The pasture is usually cut with a mower, and a sweep rake is very useful for handling the cut grass.

The cutting of excess pasture growth for silage permits of an improvement in the sward by allowing surplus growth to be removed at the best time for the pasture. Silage should be made, whenever possible, from the better quality material offering at times which are unsuitable for hay making. Silage making is complementary to hay making, and there is considerable scope for an extension of this method of pasture management, viz., cutting of excess growth which cannot be eaten down by stock in order to allow more vigorous growth of the remaining sward.

A further advantage of silage making as opposed to hay making in the conservation of pasture products is the aspect that silage making permits of cutting earlier and under more uncertain weather conditions, thus allowing the pasture to make good growth and protect the plant roots and soil surface from the drying action of the sun later in the season, or the ill effects of hot winds and other adverse factors.

Farmyard Manure.

Farmyard manure is a valuable commodity that should not be allowed to go to waste.

A large part of the plant food in the herbage eaten by farm animals is voided in the dung and urine, and the return of this excreta to the soil is most necessary if the fertility of the soil is not to be exploited.

Pasture research officers of the Victorian Department of Agriculture point out that, as a fertilizer, farmyard manure contains, in addition to the several mineral elements necessary for plant growth, organic or vegetable matter that breaks down in the soil to form humus. This humus serves the dual purpose of maintaining the soil in a good physical condition, and providing food for the millions of micro-organisms essential for soil fertility.

Most farmers do not make any provision for collecting the urine that is allowed to run away from the milking shed, while the dung is frequently thrown on to a heap where it wastes away.

Probably the most satisfactory method of conserving the fertilising matter in farmyard manure is to allow the urine and washings from the milking shed to drain into a sunken tank, and to collect and deposit the dung from the yards into a pit from which the drainage will also run into the tank. The distribution of the liquid can be carried out with a liquid manure spreader in the form of a portable tank.

Of the two forms of excreta, the urine is the most valuable fertiliser, and from the point of view of preventing a potash deficiency in overworked pastures, it is the more important.

Superphosphate is, and probably always will be, the most important fertiliser in this State, but its outstanding value should not be permitted to obscure the value of those lesser known, but nevertheless important minerals, the return of which to the soil through the dung and urine is necessary for the maintenance of productive pastures.

Disarmament in the Cow Yard.

"We want disarmament in the cattle world. All dairy animals should be dehorned." Professor Petersen, America's leading authority on dairying, made this comment when on a recent visit to England. He added—"The dairy animal has no need for horns except aggressively. She has no need to protect herself any more and they are definitely a menace to any timid members of the herd." Dehorned animals have, Professor Petersen said, been accepted by breed societies in America for years. It was permissible to dehorn any breed but custom decreed that the Jersey and the Ayrshire stood a better chance in the show ring, when dehorned.

—*Australian Dairy Review.*

The Cow's Age—Effect on Milk.

That the age of a cow has some influence on the composition of milk is claimed by Mr. O. St. J. Kent, B.Sc., who points out that the most important change with advancing years is a slight decrease in the percentage of fat. The variation, although of no great consequence, is noticeable nevertheless. A cow which shows an average test of 5 per cent. fat as a young animal, will decline to about 4.5 per cent. if she continues to produce to 14 years of age.

It is sometimes thought that a heifer showing a low test as a two-year-old may improve as she matures. Experiment, however, has shown that there are no grounds for such belief, and any farmer building up hopes of this nature is likely to be disappointed. The richness of milk is a matter of inheritance and so far as is known, nothing can be done to change it in the individual animal.

The effect of age on the fat test of milk should not be confused with the effect of age on milk production. There is a gradual increase in the quantity of milk produced until a maximum period is reached, after which the production figures show a decline. The age of maximum milk production for most breeds is eight or nine years.

—*Australian Milk and Dairy Products.*

Herd Testing and the Cost of Production.

Dairy farmers can make more profits by lowering the cost of production, and as has been frequently pointed out in this paper the quickest way to reduce the cost of production is to increase the yield per unit. In two words BREED and FEED. The quickest way to decide what results are being obtained is to test all cows, and to assist in this the Department of Agriculture has made certain funds available to help these farmers who are anxious to help themselves.

How does testing the herd link up with BREED and FEED?

In the first place there's feeding and records obtained from testing will enable you to feed according to production and so get the most out of your feed, be it grain, hay, ensilage, or just grass.

Then there's culling and your testing records enable you to cull the low producer. Often a few boarder cows will reduce profits by eating feed and taking up space and time when they are not producing their share. The herd record books point out the good cow from the bad and the dairy farmer can cull out the bad.

Good dairymen know that using any bull is a gamble until he proves himself through production records of his daughters. Testing and record keeping gives this information and proves the bull in the shortest time possible.

Testing and records point out the good breeding cows in your herd, and good breeders; those animals which transmit good production to their offspring are a big help in building up your herd replacements for future profits.

Any quick change in production, whether it is poor feeding, poor management or what, can be noticed immediately from your record book. And the quick correction of the fault can easily mean big increases in production, big reduction in costs per unit and big increases in profits for the owner.

And another record which pays dividends is the record of the breeding times. This tells you just when each cow should be dried off to enable her to secure the necessary rest before her next lactation period, and enable the guess work to be taken out of calving times.

To those farmers who supply milk for the liquid milk trade this is most important on account of the higher price which usually rules during the winter months.

—*The Unity Co-operator* (Toowoomba).

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

YOUR CHILD'S EYES ARE A PRECIOUS POSSESSION.

IT would be most unusual for anyone having an expensive camera which he knew could not possibly be replaced—not to take the greatest care of it. It is therefore quite illogical that people do not take the greatest care of two very precious cameras with which they are provided at birth—namely their eyes.

Parents should learn as much as possible about eyes and their care so that they can safeguard not only their own eyesight but that of their children. As a child reaches an age when he can appreciate the importance of such things he in his turn should be taught the vital necessity of taking care of his eyes.

The eyes are like a camera and have parts which work in the same way as those of a camera work. They have a lens to see near and far objects, a shutter or iris to cut down the light, a dark chamber like the camera box to keep out side light, and the retina which, like the film, makes photographs of the scenes we look at.

For the first 5 or 6 weeks after birth the muscles of a baby's eyes are quite unco-ordinated, but by the age of 3 or 4 months he can usually fix his eyes on objects straight in front and follow them well when they are moved.

The eyes of a normal child are straight. He does not frown or become tired when reading and he sits in an easy natural position. His eyes are bright and free from redness and he does not complain of headaches.

To Preserve the Eyesight.

In order to keep the eyes working normally, it is a good plan to have the eyes and vision of every child examined when he begins to read and at least once a year afterwards.

Unless carefully watched and cautioned, children often read in a poor light or by a badly adjusted light or for too long at a time.

Reading should only be allowed when there is a good steady light. The correct way is for the child to sit with his back to the light and with the light coming over the shoulder so that there are no shadows.

The book or paper should be held 11 to 14 inches from the eyes. The type should be large and distinct.

Children should not be permitted to read facing a light and if the table is highly polished some covering of dull faced dark-coloured material should be provided so that the light is not reflected into the child's eyes. Children's books should be printed on dull not glossy paper.

To prevent over-strain of the eyes during reading or studying, children should be taught to raise the eyes often and look out of the windows or into a distant corner of the room. This rests the muscles of the eyes.

Defective Eyesight Should be Recognised Early.

To do his best work a child needs normal vision and if his sight is defective it should be corrected by glasses.

Unfortunately, children may suffer from poor sight without the condition being recognised by parents or teachers and a child may be accused of being dull or clumsy when in reality he cannot see the writing on the blackboard or the objects over which he stumbles. Regular examination of the eyes will prevent this regrettable mistake.

Any further advice on this and other matters connected with children may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau,* 184 *St. Paul's Terrace, Brisbane,* or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

HANDY HOME HINTS.

Clothes Cleaning Hints.

To remove stains, the material should first be considered: its colour, weight, and composition, whether it be from animal or vegetable fibre, the substance making the stain, and the kind of substance which will remove that type of stain.

Cotton, linen, and artificial silk are of vegetable fibre origin; wool and real silk, animal fibre.

The materials used as stain removers may be classed as bleaches, solvents, absorbents, and neutralizers. Of these, the solvents are the ones in general use, such as alcohol, benzine, chloroform, or turpentine. These may be used on material which water will spot. Absorbents are used for grease. Bleaches should be used as a last resort and only in a mild solution. In using bleaches be sure you know the composition of them, for strong alkali will destroy animal fibres, and strong acids destroy vegetable fibres.

Common Stains and Their Treatment.

Blood and meat juices—cold water, soap and cold water, starch paste.
Blueing—boiling water.
Chocolate and cocoa—borax and cold water, bleach if necessary.
Coffee and tea—cold water, then hot water.
Cream and milk—cold water, then soap and tepid water.
Egg—cold water.
Fruit and fruit juices—boiling water, bleach if necessary.
Grass—cold water, soap and cold water, alcohol.
Grease and oils—blotting paper, warm water and soap, petrol or benzine.
Iodine—warm water and soap, alcohol, or ammonia.
Ink—try cold water, then bleach if needful.
Iron—paste of lemon juice and salt.
Kerosene—warm water and soap.
Lamp black and soot—kerosene, benzine, or gasoline.
Medicine—alcohol.
Mildew—if fresh, try cold water, javelle water, or soak in sour milk and put in the sun.
Paint and varnish—turpentine, chloroform, or alcohol.
Perspiration—soap and water, bleach with javelle water in sun.
Pitch, tar, or wheel grease—rub with lard, then wash with soap and water.
Scorch—bleach in sun or with javelle water.
Shoe polish, black—turpentine; tan—alcohol.
Stove polish—cold water and soap, gasoline.
Vaseline—kerosene or turpentine, or absorbents.
Wax—scrape off as much as possible; use absorbents or gasoline.

Special Cleaning.

A little special cleaning will help preserve a well groomed appearance and add months of wear to a garment.

To wash corduroy. Corduroy is a kind of cotton velvet and may be successfully washed provided it is not rubbed, squeezed, or ironed. Use a solution of mild soapsuds, souse the garment up and down in the soap suds, changing the suds when dirty, rinse in several waters until no more dirt or soap comes out. Hang up dripping wet in the shape in which it is to be worn, dry in the wind if possible; when dry, brush briskly to raise the nap.

To freshen velvet. When the nap is crushed, steam carefully by laying a wet cloth over the back of the velvet, lift the two together and pass over an inverted hot iron, or hold velvet stretched over the steam from a vessel of boiling water. Dust may be removed by brushing, then sponging carefully and then steaming.

Woollens and most silks may be washed if care is exercised. Use lukewarm water both for washing and rinsing, using a very mild soap solution. Never rub soap directly in silk or wool. Use a kneading motion in washing rather than rubbing. Oft-times a garment which has been carefully washed is ruined in the drying. The sun will shrink woollens, harden them, and turn white silk and wool yellow; it will fade colours, too. Dry wool in the shade or indoors; wrap white silk in a cloth and leave at least half an hour or longer and press with an iron not too hot.

To remove wrinkles, sponge with clear water and press. To remove shine, sponge with a solution of one tablespoonful of ammonia in one quart water, then with clear water; press and then brush to raise the nap.

Dry cleaning is cleaning without water but not necessarily without liquids. Gasoline and benzine are the most common of the dry cleaners. They are very inflammable, but can be used with safety if ordinary precautions are used. That is, use only out of doors away from a fire and never store in the house.

IN THE FARM KITCHEN.

A Dish for Supper.

One pound of onions, ¼ lb. bacon rashers, 3 oz. cheese, ¼ cup of milk. Put a layer of bacon in a piedish, cover with sliced onions, and fill the dish in this way. Sprinkle with pepper and salt; pour over the milk, cover the dish and bake. Then slice or grate the cheese over and put back into the oven until the cheese has melted. Any odd bits of bacon can be used, and it makes a nice dish for supper.

Mint Chutney.

This is a change from the ordinary chutney: ½ lb. ripe tomatoes, 1 lb. cooking apples, 6 small onions, ½ cup of mint leaves, ½ cup of currants or sultanas, 3 cups of vinegar, 2 cups of sugar, 2 teaspoons of dry mustard, and 2 oz. of salt. Boil the vinegar, add sugar and seasonings, let cool. When cool add the chopped ingredients and boil until the apples are tender and seal in jars. Allow to stand at least ten days before use. This chutney keeps its fresh flavour.

Chilly Day Chowder.

Half pint butter or haricot beans, ½ pint sliced tomatoes (bottled will do), salt and pepper to taste, 1 pint milk, ½ pint diced carrots, 1 tablespoon chopped onion, 1½ quarts cold water, 1 tablespoon minced parsley, 1 tablespoon flour, a little extra water. Rinse beans, then place in a basin. Cover with the water. Stand for 12 hours. Turn the water remaining into a pan. Bring to the boil, then add vegetables, except parsley. Cover and simmer till tender. Add salt and pepper to taste. Cream flour with a little water. Stir into chowder. Add milk. When boiling, cover and simmer for half an hour. Add parsley. Enough for five or six persons.

Three-in-One Pumpkin.

Pumpkin, small quantity of dripping, apples, bacon, minced meat, salt and pepper. Cut a pumpkin in half, remove the seeds, rub the inside with dripping, and steam half an hour. Take it out of the steamer and fill it with cold minced meat, a little bacon and gravy (or vegetable stock) to moisten. Top with raw apples, sliced thin. Cover with well-greased paper and bake three hours, serving it in the shell as it comes from the oven.

QUEENSLAND WEATHER IN MAY.

Heavy to flood rains commenced at the end of April in the South-eastern corner of the State and continued during the first three days of May. These opportune falls were the chief contribution to the over-average figures in the Port Curtis, Moreton, Darling Downs and Maranoa districts. Coastal areas benefited to the extent of five inches and many parts of the Downs and Maranoa averaged approximately two and a half inches, with normal one inch amounts in the Warrego. In all these districts the winter should commence with favourable prospects for agricultural, pastoral and dairying industries. The Central Coast, East, rains, during the same period, were under-average, but in many districts they came at a time to do most benefit. Only very isolated useful totals, however, were registered in the adjacent Central Highlands, East Carpentaria fringe, and parts of the central interior.

Throughout the greater part of the main inland pastoral areas from the Gulf to the south-west many stations have received practically no rain since March. In February, a considerable portion of the South-west and southern border areas were placed in a good wintering position by a three to six inch over average rain, but elsewhere, with the absence of any inland monsoonal rain during the summer, there has been a steady general seasonal deterioration since the relief rains of September, 1947, and patchier follow up storms which practically ceased during the early part of December.

Floods.—Some very heavy local daily rain totals included 10 inches at Theebine and 1427 points at Miva (30th April). On the 1st May many 5 to 6 inch totals were recorded in coastal districts from the southern border to the Rockhampton area. Heavier amounts included 666 points at Petrie, 755 Goodwood, 740 Rosedale, 766 Lowmead and 1235 at Bustard Head. The Mary River carried the highest flood waters because of the phenomenal local rains over its head waters; there was a considerable amount of flooding in low lying areas with traffic disruption.

Maximum Heights.—Mary River—Kenilworth, 29 ft. 6 in.; Cooran, 20 ft.; Gympie, 49 ft. 2 in.; Miva, 42 ft. 6 in.; Tiaro, 44 ft.; Maryborough, 19 ft. 3 in.

Temperature.—Maximum temperatures were below normal over most of the State, up to 3.0 deg. at Mitchell and 4.7 deg. at Georgetown, but Palmerville. 89.7 deg., was 1.8 deg. above.

Minimum temperatures were slightly above normal in the Cairns, Georgetown, Palmerville, Longreach areas, but below normal in southern districts; Mitchell 3.0 deg. and Thargomindah 4.0 deg.

Frosts.—Many frosts in the south-eastern quarter, especially the latter half of the month when they were practically continuous with some sharp low readings. Stanthorpe 17 nights (10 consecutive), 18 deg. screen and 10 deg. grass, 31st (10 deg., equal to previous May record 1927). Mitchell 15 nights (13 consecutive), 25 deg. and 16 deg. 31st. Kingaroy 14 nights (6 consecutive), 26 deg. and 21 deg. 22nd.

Brisbane.—Mean pressure $\frac{9+3}{2}$ 30.038 in., normal 30.086 in.—Temperature—Mean maximum 73.5 deg., normal 73.6 deg.; Highest daily 83.5 deg., 5th; Mean minimum 53.7 deg., normal 55.6 deg.; Lowest daily 43.0 deg., 22nd; Mean temperature 63.6 deg., normal 64.6 deg.

Rainfall.—490 points, 6 days; average 273 points, 10 days.

Rain position is summarised below:—

Division.	Normal Mean.	Mean May, 1948.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	137	364	166 above
Peninsula South	50	6	88 below
Lower Carpentaria	38	Nil	100 ,,
Upper Carpentaria	58	19	67 ,,
North Coast, Barron	300	125	58 ,,
North Coast, Herbert	434	182	58 ,,
Central Coast, East	165	82	50 ,,
Central Coast, West	81	23	72 ,,
Central Highlands	127	57	55 ,,
Central Lowlands	87	47	46 ,,
Upper Western	51	1	98 ,,
Lower Western	69	Nil	100 ,,
South Coast, Port Curtis	203	510	152 above
South Coast, Moreton	349	538	54 ,,
Darling Downs, East	156	246	58 ,,
Darling Downs, West	143	287	101 ,,
Maranoa	137	262	91 ,,
Warrego	112	97	13 below
Far South-West	97	19	80 below

Commonwealth of Australia, Meteorological Bureau, Brisbane

ASTRONOMICAL DATA FOR QUEENSLAND.

JULY.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.		MINUTES LATER THAN BRISBANE AT OTHER PLACES.							
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.39	5.3	Cairns	9	49	Longreach	27	43
6	6.39	5.5	Charleville ..	25	20	Quilpie	37	33
11	6.39	5.7	Cloncurry	37	63	Rockhampton ..	1	19
16	6.38	5.10	Cunnamulla ..	31	27	Roma	15	19
21	6.36	5.12	Dirranbandi ..	22	16	Townsville ..	8	41
26	6.34	5.15	Emerald	12	28	Winton	29	51
31	6.31	5.17	Hughenden ..	21	49	Warwick	5	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	a.m.	p.m.
1	12.42	12.31
2	1.38	1.03
3	2.38	1.40
4	3.40	2.22
5	4.46	3.13
6	5.53	4.13
7	6.57	5.20
8	7.55	6.31
9	8.45	7.42
10	9.29	8.51
11	10.08	9.57
12	10.43	11.00
13	11.16	..
		a.m.
14	11.49	12.02
	p.m.	
15	12.24	1.03
16	1.02	2.04
17	1.44	3.05
18	2.31	4.06
19	3.22	5.03
20	4.16	5.57
21	5.12	6.45
22	6.09	7.27
23	7.04	8.04
24	7.57	8.37
25	8.50	9.07
26	9.42	9.35
27	10.34	10.03
28	11.28	10.31
29	..	11.01
	a.m.	
30	12.24	11.34
		p.m.
31	1.24	12.13

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19; Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	17	22	32	38	8	13	37	44
6	9	30	25	45	0	21	26	53
11	15	21	31	38	7	12	35	43
16	27	13	43	26	18	3	50	32
21	29	10	45	24	20	0	52	27
26	19	17	36	33	10	8	41	37
31	12	28	27	43	2	19	30	51

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	24	36	46	55	31	40	21	31
3	15	46	40	61	25	47	14	38
5	6	53	35	66	20	51	6	44
7	3	53	34	66	18	51	4	44
9	11	46	38	61	23	47	10	38
11	21	34	44	54	29	39	18	29
13	33	23	52	45	37	30	27	20
15	43	17	60	42	45	27	36	16
17	52	7	66	35	50	21	43	8
19	53	3	68	32	51	18	45	4
21	53	4	67	33	50	19	44	5
23	45	11	61	38	46	23	37	11
25	35	20	54	44	39	29	29	18
27	26	30	47	50	32	35	22	25
29	20	39	44	57	29	42	18	34
31	11	49	38	63	23	49	10	41

Phases of the Moon.—New Moon, 7th July, 7.09 a.m.; First Quarter, 13th July, 9.30 p.m.; Full Moon, 21st July, 12.31 p.m.; Last Quarter, 29th July, 4.11 p.m.

On 15th July, the Sun will rise and set respectively, about 23 degrees north of true east and true west, and on the 12th and 26th the Moon will rise and set at approximately true east and true west respectively.

On 4th July, the earth will be in Aphelion—the point in its orbit farthest from the Sun. There will then be 94,600,000 miles between the Sun and us.

Mercury.—Will be a morning object all this month, rising about 50 minutes before the Sun on the 1st and reaching greatest elongation west on the 16th, when it will rise more than 1½ hours before sunrise. At the end of July it will rise about ¾ hour before the Sun.

Venus.—Now a morning object, and on the 1st will be 1 degree north of Mercury, but both planets are rather too close to the Sun for observation. On the 31st, in the constellation of Taurus, it will again reach greatest brilliancy and will rise about 2¾ hours before the Sun.

Mars.—In the constellation of Virgo, at the beginning of July, will set between 10.30 p.m. and 11.30 p.m., and by the end of the month will set between 9.45 p.m. and 11 p.m.

Jupiter.—Just to the east of Scorpio, now rising during the afternoon and is well up in the sky by nightfall. On the 1st Jupiter will set just after sunrise, and by the end of the month will set between 3.15 a.m. and 4.15 a.m.

Saturn.—Low in the west during evening twilight at the beginning of the month, but by the end of July may be too close to the Sun to be observable.

N
E
W
S
Little Dipper
Kochab
Dubhe
Big Dipper
Merak
Polaris
Mizar
Alkaid
Cor Caroli
Vega
Cygnus
Deneb
Rasalhague
Ophiuchus
Arcturus
Alphecca
Mirak
Algenubi
Algol
Regulus
Leo
Denebola
Corvus
Spica
Virgo
Libra
Scorpio
Antares
Milky Way
Sagittarius
Capricornus
Pointers
Centaurus
Southern Cross
Triangulum Aust
Pavo
South Pole
False Cross
Argo
Large Mag. Cloud
Small Mag. Cl
Hydrus
Canopus
Achernar
Grus
Alpha Centauri
Alpha Crucis
Tail of Scorpio
Ara
Triangulum
Fomalhaut
Aquarius
Pisces
Pegasus
Andromeda
Cassiopeia
Perseus
Algol
Aries
Hamal
Alpheratz
Mirach
Almach
Taurus
Aldebaran
Pleiades
Gemini
Capella
Auriga
Menkalinan
Alhena
Sirius
Canis Major
Procyon
Rigel
Orion
Betelgeuse
Mirzam
Eridanus
Phact
Achernar
Hydrus
Small Mag. Cl
Canopus
Argo
South Pole
False Cross
Grus
Fomalhaut
Capricornus
Sagittarius
Milky Way
Altair
Aquila
Deneb
Cygnus
Vega
Cygnus
Albireo
Cor Caroli
Alkaid
Mizar
Polaris
Merak
Dubhe
Kochab
Little Dipper
Big Dipper
Regulus
Alphard
Hydra
Corvus
Spica
Virgo
Leo
Cancer
Pollux
Procyon
Sirius
Canis Major

RAINFALL IN THE AGRICULTURAL DISTRICTS.

MAY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May	No. of years' records.	May 1947.	May 1948.		May	No. of years' records.	May 1947.	May 1948.
North Coast.	In.		In.	In.	*South Coast—cont.*	In.		In.	In.
Atherton	2·34	42	3·32	1·90	Gatton College	1·53	44	1·74	..
Cairns	4·51	61	5·23	1·69	Gayndah	1·55	72	0·26	3·62
Cardwell	3·64	71	4·35	1·13	Gympie	2·91	73	1·64	4·80
Cooktown	2·76	67	6·51	0·54	Kilkivan	1·85	62	1·49	3·93
Herberton	1·72	57	1·06	1·52	Maryborough	3·01	72	1·94	7·35
Ingham	3·76	51	7·52	0·88	Nambour	5·09	47	3·72	7·86
Innisfail	12·39	62	16·12	3·08	Nanango	1·60	61	2·69	2·51
Mossman	3·10	19	4·84	0·99	Rockhampton	3·03	72	1·34	4·15
Townsville	1·24	72	1·06	1·43	Woodford	1·55	55	2·88	6·27
Central Coast.					*Central Highlands.*				
Ayr	1·09	56	1·02	1·21	Clermont	1·29	47	0·62	0·10
Bowen	1·28	72	0·62	0·43	Springsure	1·23	74	1·41	0·44
Charters Towers	0·78	61	0·81	0·45					
Mackay	3·86	72	1·81	0·83	*Darling Downs.*				
Proserpine	4·22	40	1·91	0·89	Dalby	1·29	73	1·37	2·30
St. Lawrence	1·74	72	1·93	1·19	Emu Vale	1·12	47	1·15	1·54
					Jimbour	1·21	64	0·90	0·95
South Coast.					Miles	1·51	58	1·64	1·80
Biggenden	1·80	44	0·61	4·10	Stanthorpe	1·75	70	0·99	2·23
Bundaberg	2·63	60	1·75	8·13	Toowoomba	2·14	71	2·43	3·48
Brisbane Bureau	2·79	95	2·18	4·90	Warwick	1·48	78	1·80	2·17
Caboolture	3·27	67	2·45	6·64					
Childers	2·17	48	1·30	6·85	*Maranoa.*				
Crohamhurst	5·04	50	4·41	10·13	Roma	1·42	69	1·38	2·51
Esk	2·60	56	1·81	3·47	St. George	1·41	62	1·25	2·56

CLIMATOLOGICAL DATA FOR MAY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure. Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	82	68	87	3	62	21	169	10
Herberton	..	73	55	82	3	44	17	152	9
Townsville	..	82	63	87	2	51	21	143	1
Rockhampton	30·08	78	52	87	5	41	28	415	5
Brisbane	30·09	73	53	83	5	43	22	490	6
Darling Downs.									
Dalby	..	71	42	81	5	29	31	230	4
Stanthorpe	..	65	35	79	14	18	31	223	6
Toowoomba	..	67	42	77	5	30	21	419	7
Mid-Interior.									
Georgetown	29·97	81	60	93	7	48	28	Nil	Nil
Longreach	30·11	80	53	92	19	44	28	87	2
Mitchell	30·15	70	41	83	5	30	22	118	3
Western.									
Burketown	..	89	62	95	5	51	22, 25	Nil	Nil
Boulia	30·06	79	53	89	4	33	28	Nil	Nil
Thargomindah	30·14	70	46	83	4, 13	37	21, 28	9	2

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.